The American Statistician

A Publication of the American Statistical Association

FEBRUARY, 1960
Volume 14, No. 1

THE PRESIDENT'S COLUMN 1
NEWS 2
INTERNATIONAL STATISTICAL ACTIVITIES 8
FEDERAL STATISTICAL ACTIVITIES 10
GOVERNMENT OF CANADA STATISTICAL ACTIVITIES 15
STATISTICS AND EDUCATION FOR BUSINESS
By Maurice W. Lee 16
THE RELATION BETWEEN CONFIDENCE INTERVALS AND TESTS OF SIGNIFICANCE—A TEACHING AID
By Mary G. Natrella 20
STATISTICS IN INDIA
By E. Douglass Burdick and K. C. Seal 23
A NOTE ON "CHARACTERISTICS OF THE MEMBERSHIP OF THE AMERICAN STATISTICAL ASSOCIATION, 1958"
By A. J. Jaffe 27
QUESTIONS AND ANSWERS *Edited by Ernest Rubin*
The Quantitative Data and Method of the Rev. T. R. Malthus 28
ELECTION OF NEW FELLOWS 32
NEWS ABOUT MEMBERS 33
CHAPTER NOTES 35

$1.50 per year
35 cents per copy

CHAPTER PRESIDENTS AND SECRETARIES

ALBANY—**Herbert L. Bryan,** *Director of Research and Stat., New York State Dept. of Correction, 39 Columbia Street, Albany, New York;* **Marjorie McGillicuddy,** *20 S. Allen Street, Albany, New York*

AUSTIN—**N. K. Woerner,** *Dept. of Public Safety, North Austin Station, Austin, Texas;* **P. John Lymberopoulos,** *Dept. of Business Services, University of Texas, Waggener Hall 415, Austin 12, Texas*

BOSTON—**Frederick Mosteller,** *Dept. of Statistics, Harvard University, 2 Divinity Ave., Rm. 311, Cambridge 38, Massachusetts;* **John E. Alman,** *Office of Statistical Service, Boston University, 725 Commonwealth Avenue, Boston 15, Mass.*

BUFFALO-NIAGARA — **Richard N. Schmidt,** *School of Business Adm., University of Buffalo, Buffalo, N.Y.* **Edward Dowd,** *Roswell Park Memorial Institute, Buffalo, N.Y.*

CENTRAL INDIANA—**John R. Virts,** *6143 Meadowlark Drive, Indianapolis 26, Indiana;* **Robert A. Calhoun,** *State Board of Health, Indianapolis, Indiana*

CENTRAL IOWA—**Robert J. Buehler,** *Statistical Laboratory, Iowa State College, Ames, Iowa;* **Harvey N. Albond,** *City Plan and Zoning Commission, Des Moines, Iowa.*

CENTRAL NEW JERSEY—**Mrs. Gladys W. Ellsworth,** *Research & Statistics, N. J. State Dept. Cons. & Economic Development, 520 E. State Street, Trenton 7, New Jersey;* **Rueben Cohen,** *Opinion Research Corp., North Harrison Street, Research Park, Princeton, New Jersey.*

CHICAGO—**Lawrence R. Stickler,** *R. R. Donnelley & Sons, Co., 350 East Cermak Road, Chicago 16, Illinois;* **Louis S. Drake,** *Calumet & Hecla, Inc., 122 South Michigan Avenue, Chicago 3, Illinois.*

CINCINNATI — **Ram Gnanadesikan,** *Procter & Gamble Co., M. A. & R. Building, Ivorydale, Cincinnati 17, Ohio;* **James T. Tumbusch,** *General Electric Co., Testing Operation, F.P.L.D., Building 305, Cincinnati 15, Ohio*

CLEVELAND—**Charles H. Joseph, Jr.,** *The World Publishing Co., 2231 W. 110th Street, Cleveland 2, Ohio;* **Morris Darnovsky,** *Market Research Services, 565 Hippodrome Bldg., Cleveland 15, Ohio*

COLORADO-WYOMING—**Pearl A. Van Natta,** *Child Research Council, School of Med., University of Colorado, 4200 E. 9th Avenue, Denver, Colorado;* **Donald N. Livingston,** *1644 South Ivy Way, Denver 22, Colorado*

COLUMBUS—**Robert B. Miner,** *Dept. of Business Organization, Ohio State University, Columbus, Ohio;* **Mikhail V. Condoide,** *188 West 10th Avenue, Columbus 1, Ohio*

CONNECTICUT—**Robert R. Kirkland,** *The Southern New England Telephone Co., 227 Church Street, New Haven 6, Connecticut;* **Richard A. Greenberg,** *Div. of Cancer & Other Chronic Diseases, Connecticut State Dept. of Health, Hartford, Connecticut*

DAYTON—**John E. Condon,** *2813 Nacoma Place, Dayton 10, Ohio;* **Theresa Fricke,** *1104 Creighton, Dayton 20, Ohio*

DETROIT—**Harry Sharp,** *Survey Research Center, University of Michigan, Ann Arbor, Michigan;* **Miss Martha Seger,** *915 Sybil, Ann Arbor, Michigan*

HAWAII — **Gordon Frazier,** *Bank of Hawaii, Bishop & King Streets, Honolulu 13, Hawaii.* **George H. Tokuyama,** *4005 Koko Drive, Honolulu 16, Hawaii*

UNIV. OF ILLINOIS—**Earl R. Swanson,** *Dept. of Agricultural Economics, University of Illinois, 305 Mumford Hall, Urbana, Iinois;* **Henry F. Kaiser,** *Bureau of Educational Research, 1007 S. Wright Street, Champaign, Illinois*

ITHACA—**C. R. Henderson,** *Department of Husbandry, Cornell University, Ithaca, New York;* **Philip J. McCarthy,** *New York State School of Industrial & Labor Relations. Cornell Univ., Ithaca, N. Y.*

MILWAUKEE—**Edward F. Hornick,** *Wisconsin Telephone Company, 740 North Broadway, Rm. 320B, Milwaukee 2, Wisconsin.* **Joseph W. McGee,** *Dept. of Sociology, Marquette University*

MONTREAL — **Roger Lessard,** *Ecole Polytechnique, 1430 St. Denis, Montreal, Que., Canada;* **James A. Coombs,** *The Bell Telephone Co. of Canada, Montreal, Quebec, Canada.*

NEBRASKA—**Bernard Harris,** *Dept. of Mathematics, University of Nebraska, Lincoln 8, Nebraska;* **James B. Hassler,** *Dept. of Agricultural Economics, University of Nebraska, Lincoln, Nebraska*

NEW ORLEANS—**Roland Pertuit,** *4871 Metropolitan Drive, New Orleans, Louisiana;* **Elsie M. Watters,** *School of Business Administration, Tulane University, New Orleans, Louisiana*

NEW YORK—**Robert E. Lewis,** *Economics Department, First National City Bank of N. Y., New York 15, N. Y.;* **Sidney Sameth,** *Union Health Center, 275 7th Avenue, New York, New York*

NORTH CAROLINA—**Bernard G. Greenberg,** *Dept. of Biostatistics, School of Public Health, University of North Carolina, Chapel Hill, North Carolina;* **Roy R. Kuebler, Jr.,** *Dept. of Biostatistics, University of North Carolina, Chapel Hill, North Carolina.*

NORTH TEXAS—**Leroy Folks,** *713 Sherwood, Richardson, Texas;* **Paul D. Minton,** *Computing Laboratory, Southern Methodist University, Dallas 22, Texas*

OKLAHOMA CITY—**William R. Wells,** *4401 N. W. 50, Oklahoma City, Oklahoma;* **Ellen L. Bryan,** *2505 Northwest 31st Street, Oklahoma City, Oklahoma*

PHILADELPHIA — **Benjamin J. Tepping,** *National Analysts, Inc., 1015 Chestnut St., Philadelphia 7, Pa.;* **Frederick N. Sass,** *6418 Lawnton Avenue, Philadelphia 26, Pa.*

PITTSBURGH—**Herbert Ginsburg,** *Materials Eng. Dept., Exper. Design & Stat. Analysis Sect., Westinghouse Electric Corp., E. Pittsburgh, Pennsylvania;* **Isidore Altman,** *Graduate School of Public Health, University of Pittsburgh, Pittsburgh 13, Pennsylvania.*

PUERTO RICO—**Alvin Mayne,** *2169 Calle Gen Del Valle, Santurce, Puerto Rico;* **Amadeo Francis,** *Puerto Rico Economic Association, Santurce Building, 4th Floor, Santurce, Puerto Rico.*

ROCHESTER, N. Y.—**Lionel W. McKenzie,** *Chairman Dept. of Economics, University of Rochester, Rochester, New York;* **A. Lester Lustik,** *Rochester Gas & Electric Corp., 89 East Avenue, Rochester 4, New York*

SACRAMENTO—**Robert H. Gustafson,** *Division of Research & Statistics, California State Bd. of Equalization, 1020 N Street, Sacramento, California;* **Nicolo Pino,** *Div. of Research & Statistics, Dept. of Employment, Sacramento, California.*

SAN FRANCISCO—**Charles Roumasset,** *Bureau of Labor Statistics, 630 Sansome Street, San Francisco 11, California;* **Ernest C. Olson,** *Economics Dept., Bank of America, NT&SA, 300 Montgomery Street, San Francisco, California*

ST. LOUIS—**Donald E. Paul,** *c/o Laclede Gas Co., 1017 Olive Street, St. Louis 1, Missouri;* **Edward G. Kreyling, Jr.,** *St. Louis-San Francisco Railway Co., 906 Olive Street, St. Louis 1, Missouri*

SOUTHERN CALIFORNIA — **Charles I. Landenberger,** *965 Coronado Drive, Glendale 6, California;* **Wm. V. Henderson,** *Pacific Telephone Co., Rm. 916, 740 So. Olive Street, Los Angeles 55, California*

STATE COLLEGE, PA.—**William S. Ray,** *Associate Prof. of Psychology, Pennsylvania State University, University Park, Pennsylvania;* **Judith Stoyle,** *Pennsylvania State University, Boucke Bldg., University Park, Pennsylvania*

TULSA—**Lyndral E. Marcum,** *Blue Cross Blue Shield Hospital & Physician Service, P.O. Box 1738, Tulsa, Oklahoma;* **Marshall E. Milligan,** *Stanolind Oil and Gas Co., Tulsa, Oklahoma*

TWIN CITIES, MINN.—**J. A. MacDonald,** *Federal Reserve Bank, 73 South 5th Street, Minneapolis 2, Minnesota;* **Mrs. Vida G. Hildyard,** *Remington Rand Univac, Univac Park, St. Paul 16, Minnesota*

VIRGINIA—**Ira A. DeArmon, Jr.,** *Biological Warfare Laboratories, Fort Detrick, Maryland;* **William A. Glenn,** *Dept. of Statistics, Virginia Polytechnic Institute, Blacksburg, Virginia.*

WASHINGTON, D. C.—**Seymour L. Wolfbein,** *U. S. Dept. of Labor, Washington 25, D. C.;* **Edwin D. Goldfield,** *Chief, Statistical Reports Division, Bureau of The Census, Washington 25, D. C.*

The American Statistician

FEBRUARY, 1960, VOL. XIV, NO. 1

A publication of the
American Statistical Association

Founded 1839

The Editorial Committee welcomes the submission of manuscripts for possible publication. Two copies, double-spaced, should be sent to the Editor, Morris Hamburg, E-230 Dietrich Hall, University of Pennsylvania, Philadelphia 4.

News and notes should be sent to Dana Barbour, News Editor, American Statistical Association, 1757 K Street, N.W., Washington 6, D. C.

Second class postage paid at Washington, D. C. *The American Statistician is published five times a year*—February, April, June, October and December—by the American Statistical Association, Editorial Office: 1757 K St., N. W., Washington 6, D. C. Subscription rate: one dollar and fifty cents a year or thirty-five cents per copy.

Anyone wishing to change his mailing address should allow eight weeks notice. A copy of the address taken from an issue of the periodical should accompany the change-of-address request.

The President's Column

Morris H. Hansen

The Annual Meeting held at the end of December in Washington was, by a wide margin, the largest convention of the American Statistical Association. (And this was probably true of a number of the other societies meeting jointly.) I won't go into details here; a rundown is given in the News section of this issue. But I would like to emphasize the role of those members who had so much to do with the great success of this meeting—not only from point of view of size but the quality of programs, arrangements, etc.

Charles Stewart, 1959 Program Chairman, and his committee (representing the five Sections of the American Statistical Association) can well be proud of the sessions presented. The number of sessions was somewhat greater than usual and those of you who attended the meetings know what a fine program was offered.

Raymond T. Bowman was in charge of joint arrangements among all the societies. There were twelve associations meeting in five hotels and a total attendance of over 5,600 registrants. Mr. Bowman's committee from all the societies, and with the competent services of Harry Veneman as secretary, coordinated all joint activities.

The superb job of the Local Arrangements Committee of the American Statistical Association under the supervision of Ernest J. Engquist, Jr., was quite evident to the registrants at the Shoreham Hotel. The chairmen of the various subcommittees, who functioned so smoothly, were listed in issues of THE AMERICAN STATISTICIAN in 1959. A number of members said during the meetings, or have subsequently written to the national office of the excellence of the arrangements, facilities, etc. Mr. Engquist's committee know how successful their efforts have been, but I would like once again to thank them all on behalf of the whole Association.

As is customary, a meeting of the Council of the American Statistical Association was convened during the Annual Meeting. I should like to touch briefly on some of the items discussed from the agenda.

Two yearly reports are always presented at these year-end meetings; namely, the report of the Board of Directors and the report of the Secretary-Treasurer. The former covers the major activities during the year, including a summary on publications, new chapters, committees, etc. The report will be published in the June, 1960 issue

(Continued on back cover)

NEWS

HILDRETH BECOMES JOURNAL EDITOR—NEW 1960 OFFICERS—NEW SECTION OFFICERS—1960 PROGRAM AND LOCAL ARRANGEMENTS COMMITTEES—REVIEW OF DECEMBER BOARD AND COUNCIL MEETING—SEVENTH ANNUAL MIDWEST CONFERENCE—SUMMER SESSIONS—PUBLICATIONS—JOB OPENINGS

Clifford G. Hildreth Appointed New Editor of Journal of ASA

The Board and Council of the American Statistical Association have approved the appointment of Professor Clifford G. Hildreth, Michigan State University of Agriculture and Applied Science, East Lansing, Michigan, as Editor of the JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION. Professor Hildreth fills the vacancy left when W. Allen Wallis, who had been editor since 1950, resigned in the spring of 1959 shortly after being appointed Executive Director of the Cabinet Committee on Price Stability and Economic Growth. Professor David L. Wallace of the Department of Statistics of the University of Chicago has been serving as Acting Editor.

Professor Hildreth received his Bachelor's degree from the University of Kansas and his Master's and Doctorate from Iowa State University. He is presently Professor of Agricultural Economics at Michigan State. He has been one of the associate editors of the JOURNAL since 1957.

The committee which selected Professor Hildreth was composed of three past-presidents of the American Statistical Association—Walter E. Hoadley, Chairman, William G. Cochran, and Ralph J. Watkins; and Almarin Phillips, Chairman of the Committee on Publications Policy. The committee determined to select an editor 1) known to be outstandingly competent as a statistician, 2) associated with a major university interested in furthering the professional work of its staff, 3) experienced with the JOURNAL objectives and procedures, 4) dedicated to the advancement of the field of statistics and the profession it represents, and 5) proficient as an administrator. The Committee unanimously agreed that Professor Hildreth meets these exacting qualifications.

New American Statistical Association Officers

The following national officers were elected in the mail balloting last fall:

President-Elect

MARTIN R. GAINSBRUGH, National Industrial Conference Board

Vice-President (1960-62)

GEORGE E. P. BOX, University of Wisconsin

Directors (1960-62)

HAROLD F. DORN, National Institutes of Health
FREDERICK MOSTELLER, Harvard University

Representative-at-Large (1960-61)

ROBERT E. JOHNSON, Western Electric Company

District Representatives on ASA Council (1960-61)

District No. 1
GEOFFREY BEALL, Gillette Safety Razor Co., Boston, Mass.

District No. 2
RICHARD FREUND, Eastman Kodak Co., Rochester, N. Y.

District No. 3
JOHN I. GRIFFIN, City College of New York, N. Y.

District No. 4
DANIEL G. HORVITZ, A. J. Wood & Co., Philadelphia, Pa.

District No. 5
ERNEST J. ENGQUIST, Internal Revenue Service, Washington, D. C.

District No. 6
HERBERT A. DAVID, Iowa State College, Ames, Iowa

District No. 7
ARTHUR S. LITTELL, Western Reserve University, Cleveland, Ohio

District No. 8
PALMER O. JOHNSON, University of Minnesota, Minneapolis, Minnesota

District No. 9
ROBERT SPEARS, Leslie Brooks & Associates, Tulsa, Oklahoma

District No. 10
MAURICE I. GERSHENSON, California Dept. of Industrial Relations, San Francisco, California

Sectional representatives on the American Statistical Association Council have been designated by the sections. The Biometrics Section has reappointed Paul Meier, University of Chicago, and has appointed a new representative, Arthur M. Dutton, University of Rochester. James W. Knowles, Joint Economic Committee of Congress, continues as one Council member from the Business and Economic Statistics Section; Louis J. Paradiso, Department of Commerce, has been designated as the other. Representatives of the Section on Physical and

Engineering Sciences are Cuthbert Daniel, a private consultant with offices in New York City, who has been redesignated, and Gerald Lieberman, Stanford University. The Social Statistics Section has selected Nathan Keyfitz, University of Toronto, as its new representative, and has reappointed Frederick F. Stephan, Princeton University. The Section on Training is continuing its practice of appointing to the Council the Chairman of the Section, Robert Ferber, University of Illinois, who was a member last year, and the Chairman-Elect, J. Parker Bursk, University of Pennsylvania.

Two representatives to the Council have also been reappointed by the Biometric Society (ENAR), which is affiliated with the American Statistical Association. These are Walter T. Federer, Cornell University, and S. M. Free, Jr., Smith, Kline and French Laboratories.

The complete list of officers, including the continuing officers as well as those newly-elected, will be found on page one.

Election of Section Officers

The **Biometrics Section** has elected the following new officers:

Chairman-Elect: ARTHUR DUTTON, University of Rochester

Executive Committee: DONALD MAINLAND, New York University; HARRY SMITH, JR., Procter & Gamble Co.

The continuing officers of the Section are PAUL MEIER, Chairman, and the following members of the Executive Committee: MAVIS CARROLL, JACK I. NORTHAM, MARVIN ZELEN and CALVIN ZIPPIN.

The **Business and Economic Statistics Section** elected the following in the mail balloting last fall:

Chairman-Elect: LOUIS J. PARADISO, Department of Commerce

Program Chairman-Elect: SIDNEY E. ROLFE, C.I.T. Financial Corporation

Publications Chairman: ROBERT FERBER, University of Illinois

Secretary-Treasurer: KENNETH M. WRIGHT, Life Insurance Association of America

Regional Activities Chairman: ALBERT T. SOMMERS, National Industrial Conference Board

Continuing Officers are JAMES W. KNOWLES, Chairman, and ROBERT J. EGGERT, Program Chairman.

The following officers were elected by the **Section on Physical and Engineering Sciences:**

Chairman-Elect: G. J. LIEBERMAN, Stanford University

Secretary: JAMES DOLBY, General Electric Company

The only continuing officer is PAUL E. RIDER, Chairman.

The **Social Statistics Section** chose the following new officers:

Chairman-Elect: NATHAN KEYFITZ, University of Toronto

Vice-Chairman (1960-61): THOMAS J. MILLS, National Science Foundation

Secretary (1960-61): ELI S. MARKS, National Analysts, Inc.

FREDERICK F. STEPHAN becomes the Section's 1960 Chairman and EDWIN D. GOLDFIELD continues as a Vice-Chairman.

The **Section on Training of Statisticians** elected new officers as follows:

Chairman-Elect: J. PARKER BURSK, University of Pennsylvania

Executive Committee: WILLIAM JACKSON HALL, University of North Carolina; LESLIE KISH, University of Michigan; PAUL R. MERRY, University of Denver; and R. CLAY SPROWLS, University of California at Los Angeles

Continuing officers of the Section are ROBERT FERBER, Chairman, and the following members of the Executive Committee: ERNEST KURNOW and WILLIAM WASSERMAN.

Plans For 1960 Annual Meeting

The 120th Annual Meeting of the American Statistical Association will be held at Stanford University, Stanford, California, August 23rd through 26th, 1960. The Program Committee for the American Statistical Association is already at work organizing the sessions to be presented. In addition to the organized sessions there will be sessions for contributed papers. (See the announcement concerning contributed papers elsewhere in this issue.) The Program Committee is as follows:

Chairman: Philip M. Hauser, University of Chicago, Chicago, Illinois

Biometrics Section: Oscar Kempthorne, Iowa State College, Ames, Iowa

Business and Economic Statistics Section: Robert J. Eggert, Ford Motor Company, Dearborn, Michigan

Section on Physical and Engineering Sciences: Joseph M. Cameron, National Bureau of Standards, Washington, D. C.

Social Statistics Section: Frederick F. Stephan, Princeton University, Princeton, New Jersey

Section on Training: J. Parker Bursk, University of Pennsylvania, Philadelphia, Pa.

Meeting jointly with the American Statistical Association are the following societies (listed with their Program Chairmen):

Biometric Society (WNAR): Carl E. Hopkins, University of Oregon Medical School, Portland, Oregon

Biometric Society (ENAR): Oscar Kempthorne, Iowa State University, Ames, Iowa

The Institute of Mathematical Statistics: Dorothy M. Gilford, Office of Naval Research, Washington, D. C.

Western Economic Association: Ralph I. Thayer, Department of Economics, Washington State University, Pullman, Washington

Western Farm Economic Association: E. J. Working, Department of Agricultural Economics, Washington State University, Pullman, Washington

Econometric Society: Lawrence R. Klein, Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania

The Local Arrangements Committee has been set up as follows:

Chairman—Albert H. Bowker, Graduate Div., Stanford

Vice Chairman and Transportation—Herbert Solomon, Statistics Department, Stanford

Treasurer and Meeting Room Assignments—Robert Langle, Applied Mathematics and Statistics Laboratories, Stanford.

Registration—Gerald Lieberman, Statistics Department, Stanford

Exhibits—Benjamin Epstein, Statistics Department, Stanford

Publicity—Ernest C. Olson, Economics Department, Bank of America, San Francisco

Employment Register—Margaret Thal-Larsen, U. S. Department of Labor, San Francisco

Fee Events—Rupert G. Miller, Department of Preventive Medicine, Stanford

Social Committee—Emanuel Parzen, Statistics Department, Stanford

Information—Kenneth Arrow, Department of Economics, Stanford

1959 Annual Meeting

The 1959 American Statistical Association Annual Meeting, held at the Shoreham Hotel in Washington, D.C., December 27-30, was an outstanding success. There was the largest registration in the history of the Association. 1700 were registered at the Shoreham alone, and the total registration for all the society meetings was about 5600. Eleven other societies including the American Economic Association and the American Marketing Association met jointly with the American Statistical Association. The excellent preparatory work of the Local Arrangements Committee was reflected in the smoothness with which the registration and the sessions were conducted.

More than sixty technical sessions were sponsored either by the American Statistical Association alone or jointly with other societies. Two luncheon meetings were held—the luncheon on the Economic Outlook sponsored jointly with the American Economic Association, and the Census Tract luncheon. The Presidential Address, "The Dual Function of Statistics", was delivered by Rensis Likert at the general session on Tuesday evening. The list of newly-elected Fellows, announced at the meeting, appears elsewhere in this issue. This session was followed by the usual informal party in the Terrace Banquet Room of the Shoreham Hotel.

Resolutions Adopted at Annual Meeting

The following resolutions, which had been prepared by the Committee on Resolutions, headed by Ralph E. Burgess, were adopted at the 1959 Annual Meeting in Washington, D. C.

Resolution of Appreciation to the Local Arrangements Committee

Resolved that the members of the American Statistical Association express their appreciation to Mr. Ernest J. Engquist, Jr., for his very substantial contribution as Chairman of the Local Arrangements Committee for the 1959 Annual Meeting of the Association. We acknowledge with sincere thanks the very large amount of work performed by all members of the Local Arrangements Committee, with the support and cooperation of many volunteer assistants and institutions, including the Shoreham Hotel. The outstanding success of this meeting, the largest in the Association's history, is attributable largely to this Committee's dedicated efforts and skillful handling.

Resolution of Commendation for the Program of the Meeting

Resolved that the members of the American Statistical Association record their especial thanks to Mr. Charles D. Stewart as Chairman of the Program Committee and to his associates representing the five sections of the American Statistical Association and the many others who helped to provide an excellent program. The selection and arrangement of topics have contributed substantially to the effectiveness of this 119th Annual Meeting. We extend our sincere gratitude to the program participants as well as to those who planned and organized the 61 sessions.

December Board and Council Meeting

The Board and Council of the American Statistical Association met on December 27 in conjunction with the 1959 ASA convention at the Shoreham Hotel in Washington, D. C. In addition to the 1959 President, Rensis Likert, who presided, there were present Past President Walter E. Hoadley, President-Elect (1960) Morris H. Hansen, President-Elect (1961) Martin R. Gainsbrugh, Vice-Presidents Churchill Eisenhart and Howard L. Jones, Secretary-Treasurer Donald C. Riley, all of the Directors, most of the members of the Council, and several guests.

Mr. Hoadley, Chairman of the Committee to Select the New Editor, reported the good fortune of the Association in securing Clifford G. Hildreth of Michigan State University as the new Editor of the JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION. After introducing Dr. Hildreth, he paid tribute to W. Allen Wallis, the retiring Editor. The tribute was warmly seconded by the Board and Council. A resolution expressing the Association's gratitude to David L. Wallace, who acted as Editor for most of 1959, was enthusiastically adopted.

Raymond T. Bowman, Chairman of the Joint Local Arrangements Committee, and Ernest J. Engquist, Chairman of the ASA Local Arrangements Committee, reported briefly on the meetings being held at the Shoreham and other hotels in Washington. There was also some discussion of plans for the 1960 Convention in Palo Alto, California.

Ralph Burgess, Chairman of the Committee on Institutional Membership, reported his Committee was attempting to increase institutional membership by working

with the local chapters of ASA. Local institutional committees have been set up in seventeen chapters and publicity materials have been distributed.

William H. Shaw, Chairman of the Business and Economic Statistic Section, reported on the Section's Summer Refresher Course, which was to be voted on the following day at the Section's annual business meeting. (The Section subsequently voted to hold the course at an eastern university for the first year.)

There was some discussion of a proposal to set up a continuing committee on the problem of statistics and lung cancer. Some members felt the Association should instead attempt to stimulate more discussion and research. The general consensus was that no action should be taken by the Association at this time and it was moved and voted that the matter be referred to the Committee on Committees.

Some years ago a proposal to prepare a work to be known as "The Statistician's Handbook" had been discussed with a large publishing house, which has recently indicated renewed interest. The possibility of publishing a Statistical Bibliography had also been considered. Some members of the Board and Council pointed out that several different kinds of bibliographies in the field of statistics were either under way or had been completed. It was suggested that the Section on Training be asked to investigate the matter.

As the result of a letter from the American Meteorological Society it was suggested that the Association appoint a committee of persons interested in the application of statistics to agricultural meteorology. It was moved and carried that the President be authorized to appoint such a committee with the advice of the Chairman of the Biometrics and Physical and Engineering Sciences Sections. There was some discussion as to whether a new section was needed on the natural sciences, since the principal interest of the Section on Physical and Engineering Sciences was in the physical sciences. The Committee on Committees was asked to look into the possibility.

Nathan Keyfitz, Chairman of the Committee on Committees, reported briefly on that Committee's activities in connection with the revision of the ASA Constitution. That document provides for preparation of a revision to be submitted to the membership not more than ten years after its adoption. It was the opinion of the Committee on Committees that no major changes are presently needed, though some minor changes might be desirable. The matter was left within the general jurisdiction of the Committee on Committees, but a special subcommittee headed by Boyd Ladd is being created. There was some discussion of suggestions that had been made to change the method of selection of Fellows. The Committee on Committees felt, however, that the present method is adequate and should not be changed.

The Committee on Committees reported that there are possibilities of new section interests in computing, marketing and management sciences (including operations research). It was suggested that small specialized committees be appointed to explore these matters further and make recommendations to the Board.

Donald C. Riley presented the report of the Secretary-Treasurer for 1959 which is discussed briefly in the President's Column in this issue. The 1960 proposed budget was approved with one minor change.

Seventh Annual Mid-West Conference

Final arrangements for the 7th Annual Mid-West Conference include a program featuring a Conference theme of high current interest, a speaker list composed of nationally recognized authorities, and a session involving the actual playing of a management game. The two-day Conference is scheduled for Friday, March 25 and Saturday, March 26 at Chicago's Congress Hotel. It is co-sponsored by the Chicago Chapter of the American Statistical Association and the Chicago Association of Commerce and Industry.

The Friday sessions of the Conference will be devoted to the evaluation and practical application of the new analytic techniques that are rapidly taking their place in industry. Speakers who have actually used these tools will discuss linear programming, queuing theory, Monte Carlo decisions, game theory, and the role of electronic computers in business problem solving. Each of these topics will be presented in two concurrent sessions. One will be designed to inform the neophyte on the basic concepts and applications of the techniques, while the other will be an advanced presentation and discussion session for those who are familiar with and presently using them.

The Saturday session of the Conference will be taken up by the playing of the management game. Management games have been hailed by industry leaders as one of the most significant executive training devices yet developed. This simulation technique is the business world's answer to the military's "war games." Participants in the management game will be divided into "companies" that will compete against each other. The business decisions of these "companies" will be fed into an IBM 650 computor and will be translated into the effect they have had on the company and its position in the market.

Registration forms are being mailed to ASA members in the Mid-West from the national office.

Summer Programs at Michigan

The Survey Research Center of the University of Michigan will hold its thirteenth annual summer institute in Survey Research Techniques. The dates for the regular session are July 18 to August 13, 1960, with introductory courses offered from June 20 to July 16.

This special program is designed to illustrate the theory and application of survey research to such fields as business and human relations, psychology and sociology, political behavior, public communications and influence, public health, economics, statistics, etc. Again this year a special workshop will be offered in the prac-

tical application of survey research methods to these individual fields.

Further information about the institute may be obtained by writing the Survey Research Center, University of Michigan, Ann Arbor, Michigan.

Plans are being completed for the University of Michigan 1960 summer program of intensive non-credit courses for practicing engineers and scientists. Twenty-three courses are scheduled, at fees ranging from $150 to $225. Among those of possible interest to statisticians and mathematicians are:

Introduction to Standard Methods of Numerical Analysis, June 13-24, B. A. Galler and guest lecturers

Quality Control by Statistical Methods, August 15-25, C. C. Craig and guest lecturers

Programming Concepts, Automata, and Adaptive Systems, June 13-24, J. H. Holland and guest lecturers

Advanced Numerical Analysis, June 13-24, R. C. F. Bartels, J. B. Curtz, P. K. Henrici, A. S. Householder, D. M. Young, and others

Models and Simulation in Operations Research, June 13-24, R. R. Legault, J. M. Miller, and others

Foundations and Tools for Operations Research and the Management Sciences, June 13-24, R. M. Thrall and O. Wesler

Random Processes, June 13-17, F. J. Beutler, T. G. Birdsall, W. M. Brown, G. Hok, C. J. Palermo, and guest lecturers

Further information may be obtained from Professor R. E. Carroll, Coordinator, Summer Engineering Conferences, College of Engineering, University of Michigan, Ann Arbor, Michigan.

Southern Regional Summer Session in Statistics

The 1960 Southern Regional Graduate Summer Session in Statistics will be held at the University of Florida at Gainesville from June 20 to July 29, 1960. The University of Florida, North Carolina State College, Virginia Polytechnic Institute and Oklahoma State University have agreed to operate a continuing program of graduate summer sessions in statistics to be held at each institution in rotation. The first such session was held at Virginia Polytechnic Institute in the summer of 1954.

It is the purpose of this program to serve: (1) teachers of introductory statistical courses and college teachers of mathematics who want formal training in modern statistics; (2) research and professional workers who want intensive instruction in basic statistical concepts and modern statistical methodology; (3) professional statisticians who wish to keep informed about advanced specialized theory and methods; (4) prospective candidates for graduate degrees in statistics; and (5) graduate students in other fields who desire supporting work in statistics.

The session will last six weeks and courses will carry three semester hours of credit. Not more than two courses may be taken for credit at any one session. The summer work in statistics may be applied as residence credit at any one of the cooperating institutions, as well as certain other universities, in partial fulfillment of the requirements for a graduate degree. The program may be entered at any session, and consecutive courses will follow in successive summers.

The courses to be offered in statistics in 1960 at the University of Florida are as follows: Statistical Methods I, II and III, through Sample Survey Methods; Statistical Theory I, II and III, including Probability, Inference and Least Squares; Statistical Problems; Advanced Statistical Inference; and Response Surfaces. In addition, a number of courses in the Mathematics Department will be available.

The National Science Foundation is making available to the University of Florida grants for college teachers of statistics and college teachers of mathematics who wish to attend the 1960 session. The stipend is $75 per week for the six weeks of the session plus additional amounts for dependents and travel allowances. Tuition will also be paid by the National Science Foundation. Participants must meet all the admission requirements of the Graduate School of the University of Florida and must be admitted thereto or must be a graduate student in good standing at one of the cooperating institutions. Applicants for these grants should be employed by an institution of higher learning as a teacher of mathematics or statistics; those from institutions wherein there is no opportunity for formal training in modern inferential statistics and probability will be given priority. No geographical or age limitations will be imposed, though preference will be given to the younger age group if other things are equal. The previous academic and professional record of applicants will be considered. Those who received grants in a previous session who meet the other conditions of eligibility are encouraged to apply. Applications for grants should be postmarked not later than February 15, 1960 to be assured of full consideration.

Requests for application blanks for the summer session and for National Science Foundation grants should be addressed to Dr. Herbert A. Meyer, Statistical Laboratory, University of Florida, Box 3568, Gainesville, Florida.

Minnesota Summer Session On Health Statistics

The 1960 Graduate Summer Session of Statistics in the Health Sciences, sponsored by the accredited Schools of Public Health of the United States under a research training grant from the Division of General Medical Sciences of the National Institutes of Health of the United States Public Health Service, will be held at the University of Minnesota, School of Public Health, in Minneapolis, Minnesota from June 16 to July 30, 1960.

The faculty will include: Dr. F. M. Hemphill, Dr. Boyd Harshbarger, Dr. Robert B. Reed, Dr. Albert E. Bailey, Mr. Carl L. Erhardt, Dr. Chin Long Chiang, Dr. Bernard Greenberg, Dr. Donovan Thompson, and Dr. Eugene

A. Johnson. Courses which will be taught are: Statistical Methods in Public Health; Management of Health Agency Records; Biostatistics in the Health Sciences; Demographic Methods in Public Health; Registration and Vital Records; Advanced Biostatistics in the Health Sciences; Statistical Methods in Epidemiology; Sampling Techniques in the Health Sciences; Statistical Methods in Biological Assay; Lecture Series.

A limited number of fellowships are available. For information, write Prof. J. E. Bearman, University of Minnesota, Minneapolis 14.

Translation of Russian Statistical Journal

The Society for Industrial and Applied Mathematics announces the appearance of the first issue of Volume IV of *Theory of Probability and Its Applications*. This is a complete translation into English of the corresponding issue of the Russian journal Teoriya Veroyatnostei i ee Primeneniya. During 1960 the Society will publish separately translations of all four issues of Volume IV (1959), will begin the translation of Volume V, and will publish in bound form full translations of Volumes I (1956), II (1957) and III (1958). It is expected that by early 1961 translations will be appearing within four months of publication of the Russian original.

Theory of Probability and Its Applications is a quarterly journal devoted, as its title indicates, to research papers in probability and statistics, and to related applications in physics and communications. For the most part, the journal has reported the work of Russian authors; its translation offers the first access to this material in a Western language.

The Society for Industrial and Applied Mathematics has been assisted in this translation project by a grant from the National Science Foundation.

Subscriptions to *Theory of Probability and Its Applications* are being offered at $18.00 for four current issues (one year) ($9.50 to members of the Society, add $3.00 for subscriptions outside of the U. S. and Canada). Inquiries may be addressed to the Society at Box 7541, Philadelphia 1, Pennsylvania.

Job Openings

United Nations needs statisticians for its technical assistance programs in Africa, Asia, the Middle East and Latin America. Salaries range from $7,000 to $12,500 plus income tax reimbursement and allowances. For full information write Technical Assistance Recruitment Services, United Nations, New York, New York.

International STATISTICAL ACTIVITIES

CZECHOSLOVAKIA

Beginning with 1959, the Technical Information Center is publishing a journal, *Abstrakta*, to contain abstracts of work in mathematical statistics and its applications, and applications of mathematics in economics. Further information may be obtained from: Stredisko technickych informací potravinárského prumyslu a vykupu (Technical Information Center, Ministry of Production and Purchasing), nám. Gorkého 31, Praha 3.

—*Statisticky Obzor*
Prague

GERMANY, WEST

The Federal Statistical Office publishes a series entitled *Studies on Statistics*, consisting of English translations of articles which have appeared in the German literature. The papers appear at irregular times; No. 8 was published in August 1959.

—Federal Statistical Office
Wiesbaden

INDIA

The Statistical Wing of the Indian Council of Agricultural Research has now been named as **Institute of Agricultural Research Statistics.** The Statistical Wing was founded twelve years ago by Dr. P. V. Sukhatme, first Statistical Adviser to the I. C. A. R., and has functioned as a research and training center in statistics as applied to agricultural sciences. The present I. C. A. R. Statistical Adviser is Dr. V. G. Panse.

—*Statistical News Letter*
I. C. A. R., New Delhi

KOREA

The **Korea Statistical Association** has been incorporated in Korea at the initiative of Mr. Sanguine You, Director of the official Bureau of Statistics, and with the active encouragement of the Statistical Advisory Group to the Republic of Korea, established by Surveys and Research Corporation under contract with the International Cooperation Administration. Under its charter the Association will aim to further the development of statistics within the nation; and in particular to contribute to statistical administration and various statistical activities of the Government. Regular members will be persons statistically trained or actively engaged in statistical activities. Special members may be elected by the Board of Directors, on the basis of their support of the Association's objectives.

The Association will have its office in the Bureau of Statistics of the Home Ministry, which roughly corresponds to the Bureau of the Census in some Western countries, and will have an Executive Secretary appointed by the elected President. The specific activities contemplated include the establishment of survey or research projects, the publication and dissemination of books on statistics, the training of key statisticians, and the sponsorship of lectures and discussions of research. In addition to other meetings, an annual meeting, or General Assembly, of members will elect officers, including a Board of Directors and its Executive Committee, and transact other business. A first organization meeting under the articles of incorporation is pending.

—Stuart A. Rice
Surveys and Research Corporation

SWEDEN

A summary (in English) of the recommendations of the 1956 Commission on Statistics appears together with an article entitled "A Proposal for the Future Organization of Swedish Statistical Production" (in Swedish) by O. Lindahl, in the November 1959 issue of *Statistisk Tidskrift*. The concluding paragraph of Lindahl's English summary is quoted here.

The main recommendations of the Commission were as follows:

1. Swedish State statistics should be reorganized over a five-year period and concentrated into larger units for statistical compilation.
2. A Delegation on Statistical Matters, consisting of six members, should be entrusted to conduct the re-organization, a staff should be put at the disposal of the Delegation, as well as the services of experts and means for special investigations.
3. A National Statistical Office should be formed to replace the present Central Bureau of Statistics.
4. It should be decided in principle to transfer statistics to the new Statistical Office over a five-year period, especially the statistical activities (or part of them) of Kommerskollegium (Board of Trade), Socialstyrelsen (Social Welfare Board), Bostadsstyrelsen (Housing Board), Skolöverstyrelsen (Board of Education), Arbetsmarknadsstyrelsen (Labour Market Board) and Konjunkturinstitutet (Institute of Economic Research).
5. Within the Statistical Office there should be established an economic statistical department and work on the national accounts should be attached to it.
6. The Statistical Office should have a working group for development matters, to which specialists are attached, also the working group should be at the disposal of the Delegation on Statistical Matters for its development work.
7. The Statistical Office should have a machine tabulation centre, an interview organization and library facilities, built on the corresponding organs of the Central Bureau of Statistics.

An article by Th. Lindh and E. Herner in the same issue of *Statistisk Tidskrift* describes plans for the 1960 Censuses of Population and Housing.

—Dr. Ingvar Ohlsson, Director
Central Bureau of Statistics
Stockholm

UNITED KINGDOM

A half-day conference on **Experimentation—In Theory and Practice** was held by the Industrial Applications Section of the Royal Statistical Society, December 18, 1959, at the London School of Hygiene and Tropical Medicine. The chairman of the conference was G. A. Barnard; the program follows.

Design of Experiments: Some General Principles. D. R. Cox (Birkbeck College).

Surmounting Practical Difficulties in Laboratory Experiments. E. J. Whyte (Courtaulds Ltd.)

Production and Experimentation—A Conflict? P. G. Moore (A. E. Reed and Co. Ltd.)

—Royal Statistical Society

The London publishers Methuen and Co. (well known for publication of series of scientific monographs) have announced a series of **Methuen Monographs on Applied Probability and Statistics,** with M. S. Bartlett (Manchester) as General Editor. These monographs will be published in the U. S. by John Wiley and Sons. The first of the series, published in 1959, is *The Theory of Storage* by P. A. P. Moran. Titles in preparation include: *Time Series Analysis* by E. J. Hannan, *Stochastic Processes* by L. Takacs, *Monte Carlo Methods* by J. M. Hammersley, and *Queues* by D. R. Cox and W. L. Smith.

SUPPLEMENTARY LIST OF VISITING SCHOLARS IN THE U. S.

Name	Home Country	Host Institution	Period of Visit
NAKAMURA, MITSUGU	Japan	University of Pennsylvania	Sept. 1959 - June 1960
NEWELL, DAVID J.	United Kingdom	University of North Carolina	1959 - 1960
SARGAN, J. D.	United Kingdom	University of Chicago	Sept. 1959 - Sept. 1960
SAW, J. G.	United Kingdom	University of North Carolina	Sept. 1959 - Sept. 1960
SPICER, C. C.	United Kingdom	National Institutes of Health	Nov. 1959 - Apr. 1960
TAKACS, L.	Hungary	Columbia University	1959 - 1960

FEDERAL STATISTICAL ACTIVITIES

Major Statistical Items in the 1961 Budget

Budget recommendations for the fiscal year ending June 30, 1961, presented to the Congress in January, include about $42.0 million for the current programs of the major statistical agencies—an increase of $2.9 million over the amount provided for 1960—and a total of $20.5 million for periodic programs. In addition to recommendations for specific improvements in current programs, the 1961 budget includes provision for transfer of responsibility for collection of data on department store sales and inventories from the Federal Reserve Board to the Bureau of the Census.

The recommendations for principal statistical programs are summarized by broad subject areas in a Special Analysis of the 1961 Budget, printed separately from the Budget Document. They constitute a continuation of efforts toward achievement of an integrated program designed to provide improved statistical measures of the functioning, welfare and progress of the various sectors of our national economy. The increases recommended for 1961 are, in brief:

Labor statistics.—Although no net increase is recommended for this area in 1961, funds are included for the Bureau of Labor Statistics to provide for study of the labor aspects of world markets, increased salary costs of the joint Federal-State employment statistics program, inclusion of Alaska and Hawaii in specified statistical programs, and printing the next edition of the Occupational Outlook Handbook. The funds required for these projects are offset by a reduction in the 1960 level of requirements for conversion of BLS series to the revised Standard Industrial Classification. The 1961 Budget recommendations also include provision for the Agricultural Marketing Service to expand and improve its data on farm labor, farm employment and farm wages.

Demographic statistics.—An increase of about $670,000 is recommended for the national health survey program conducted by the Public Health Service. This increase provides for a full-scale national health-examination survey, designed to complement the household-interview survey now being conducted. An increase of about $130,000 is recommended for the National Office of Vital Statistics in the Public Health Service for improvement of marriage and divorce statistics, development of life tables, and detailed tabulations of births and deaths. A small increase is also recommended to strengthen the statistical staff of the Office of Education.

Prices and price indexes.—No changes are proposed for current programs in this area. Funds for revision of the Consumer Price Index, which will include a survey of consumer expenditures, are included under "Periodic Programs" (see below).

Productions and distribution statistics.—Increases totaling over $1.2 million are recommended in this area, about half in the Bureau of the Census and half in the Department of Agriculture.

In the Census Bureau the principal increase (about $400,000) provides for improving the sample of retail establishments reporting to the Census Bureau and for integrating the department-store sales data of the Federal Reserve Board with Census Bureau retail trade statistics. The combined operation will produce monthly retail sales data by region for various kinds of business; nationwide weekly retail sales data; monthly department store sales, inventory and consumer credit data; and monthly sales and inventories for broad categories of the merchandise lines found in department stores. Other increases in the Census Bureau in 1961 provide for initiation of a monthly survey of the service trades and for preparatory work on publication of economic data on a company, rather than establishment, basis.

In the Agricultural Marketing Service an increase of about $500,000 provides for placing on an operational basis the improved agricultural estimating techniques which have been developed in the past 5 years. This increase provides for an enumerative survey of a randomly selected sample of farms in 12 Southern States, obtaining information on acreage of crops planted; objective yield measurements for cotton, corn and tobacco; and number of livestock. It also permits expansion of the objective yield measurements on corn in the North Central States to provide reliable data for estimating corn production, by State. The 1961 budget recommendations for the Agricultural Marketing Service also provide for development of agricultural estimating services in Alaska and Hawaii. In the Agricultural Research Service an increase of about $100,000 is recommended for economic research relating to market opportunities of feed-grain and livestock farmers.

Construction and housing statistics.—No increase is requested in this area for 1961. Responsibility for the collection and dissemination of construction statistics was consolidated in the Bureau of the Census in fiscal year 1960, with provision for improvement and expansion of the program. Work will continue on the present program directed toward improvements in the current monthly series on housing starts; development of more accurate estimates of month-to-month rate of activity in selected types of construction; work on construction cost indexes; and initiation of quarterly estimates of expenditures for alterations, additions, maintenance and repairs of residential properties.

National income and business financial accounts.—An increase of $110,000 is recommended to enable the Office of Business Economics to expand its work in the field of interindustry analysis; and an increase of about $160,000 is recommended to enable the Bureau of the Census to initiate a quarterly survey of State and local government finances and to supply an annual estimate of anticipated capital expenditures by State and local governments. An increase of $300,000 is also included for the Internal Revenue Service to provide for tabulating

data from the tax returns for each of the 100 largest standard metropolitan statistical areas and for increased workload and administrative costs.

Periodic programs.—The total of $20.5 million included for periodic programs in 1961 includes four items: (1) $18,000,000 to the Census Bureau for the 18th Decennial Census, to provide for a large part of the processing of the data from the censuses of population and housing, and to complete the processing and begin publication on a State and county basis of the data from the census of agriculture; (2) $1,125,000 to the Census Bureau for the 1958 censuses of business, manufactures and mineral industries, to provide for final processing and analysis and for printing costs; (3) $100,000 to the Census Bureau for preparatory work for the 1962 Census of Governments; and (4) $1,250,000 for Bureau of Labor Statistics to begin a consumer expenditure survey which will provide new weights to be used in the revision of the Consumer Price Index.

Single copies of the "Special Analysis of Principal Federal Statistical Programs in the 1961 Budget" may be obtained from the Publications Unit, Bureau of the Budget, Washington 25, D. C.

—Raymond T. Bowman,
Assistant Director for Statistical Standards,
Bureau of the Budget

Plans for the 1960 Census

Late in March 1960, the mail carriers will deliver to every household in the United States an Advance Census Report form. This will ask the householder to enter for each member of his household the information relating to age, sex, color, marital status, and relationship to head. For each housing unit he is also to enter information on the number of rooms, whether or not hot or cold running water is available, the availability of flush toilet and bathing facilities, and whether the unit is owned by the occupant or rented. In larger cities he is also asked to report on the value of the unit if it is owned, or the rental paid. He is to have this information ready when the census enumerator calls, beginning April 1.

In the more densely settled areas, including about 82 percent of the population, when the enumerator calls he will check the information entered on the form and transcribe it to the permanent census record, which is FOSDIC schedule. He will also determine, in accordance with prescribed procedures, whether the household is to be included in the 25 percent sample of the population from which additional information is to be collected. In the sample household, he will then leave a household questionnaire calling for the additional information, such as place of birth, occupation and industry, education, income, household facilities, etc., with the request that this be completed and mailed to the census office. After this first stage enumeration has been completed, approximately one-third of the enumerators will be assigned to Stage II, which consists of transcribing to FOSDIC schedules the information supplied in the household questionnaire, completing any that are incomplete, and securing information from those households in the sample for which the information is not available in the household questionnaires.

In the less densely settled areas of the country, the enumerator will complete the 100 percent items and then will proceed immediately to secure the required information from the sample households and enter this on a FOSDIC schedule.

In institutions and other places where persons do not live in households, the sample will consist of 25 percent of all individuals concerned.

Special arrangements are being made for the enumeration of persons traveling and staying at hotels, motels, and the like, and also for the enumeration of persons in jails, flop houses, all night movie theaters, and similar establishments. Particular attention is to be given in the enumeration to the inclusion of visitors who are temporarily present at the place where the enumerator finds them, and to the allocation of such persons to their usual places of residence.

The FOSDIC schedule is especially prepared for use with the Film Optical Sensing Device for Input to Computers. This device was designed and built jointly by National Bureau of Standards and Bureau of the Census engineers. It will read microfilm copies of the schedule and translate the images of the position marks directly to impulses on magnetic tape. In the case of the 100-percent schedules, no coding is necessary and the microfilming can proceed immediately on acceptance of the schedules. In the case of the sample schedules, the codes, such as those for occupation, industry, or migration, are also entered in the form of position marks, and then the schedule processed in the same way. FOSDIC will process about 100 frames of the 100-percent schedules per minute.

Much of the editing and all of the tabulation will be done with use of high speed electronic computers. The output will be in the form of magnetic tapes and in most cases these tapes will be used to prepare copy for reproduction through the medium of a high speed printer.

The combination of electronic equipment, the elimination of punch cards, and the greater use of sampling, plus the new method of enumeration, are expected to yield substantial gains in the timing of release of data. The processing of the 100-percent schedules need not, as in 1950, await the time-consuming operation of manual coding since none of those items will require such coding. Thus tabulations showing the age, sex, color, composition of the population, and the 100-percent items for housing should become available 6 to 12 months sooner than in the 1950 Census, and similar or greater gains are expected in the timing of the release of other materials.

One new feature of the field operations in the 1960 Census relates to the quality control while the field work is under way. In the two-stage areas, the training can be divided so that the first enumerators will be trained

particularly in listing, enumeration of a few simple items, and identification of the sample. The more detailed training on concepts will be given to a selected one-third of the Stage I enumerators, presumably those who have demonstrated the greatest ability in carrying out the assigned work. Every enumerator will start his work after training has been completed under the observation of his superior and will be allowed to continue only after the crew leader or field reviewer is convinced that he understands the work that he is to do. The work of each enumerator will be reviewed in accordance with a prescribed procedure, and on the basis of that review, enumerators will be allowed to proceed, retrained, or terminated as the situation may warrant. The work of each enumerator will again be reviewed before it is accepted for payment.

As in 1950, there will be a series of sample surveys and tests to measure completeness of coverage, enumerator variance, and response error. These surveys will be undertaken as nearly as possible to the time of the census itself. There will also be a comparison of information collected in the census and in the Current Population Survey.

Copies of schedules, outlines of publication tables showing expected dates of release, and other information may be obtained from the Bureau of the Census, Washington 25, D. C.

—Conrad Taeuber,
Assistant Director,
Bureau of the Census
Department of Commerce

Revision of Index of Industrial Production

The first major revision of the index of industrial production since 1953 has been released by the Board of Governors of the Federal Reserve System in the December issue of the Federal Reserve Bulletin. Major new features have been added to the index, and benchmark, weight, and comparison base data have been brought up to date to provide improved physical volume measures for analyzing economic developments in the 1960's. The revisions has been carried back in detail through 1947.

The new index incorporates the following major revisions:

(1) Coverage of the index has been broadened to include electric and gas utility output, in addition to manufacturing and mining production. This broader coverage provides a more complete representation of fuel and power production and makes the new index more comparable with industrial production measures for other countries.

(2) New combinations of production series, for the most part a rearrangement by market groupings, have been provided to facilitate analysis of cyclical and growth developments. The new market groupings provide for a division of production series between final products and materials and a subdivision of final products between output of consumer goods and output of equipment (including ordnance) for business and government use.

(3) Series have been adjusted to the levels shown by the comprehensive 1954 Census of Manufactures, annual Census surveys through 1957, and other benchmark data.

(4) A number of new monthly series have been developed.

(5) Interpolation procedures for estimating monthly changes in industries represented by manhour series have been refined.

(6) All seasonal adjustments have been revised and various new seasonally adjusted components have been developed, mainly for the market grouping of series.

(7) The latest version of the Standard Industrial Classification, prepared under the auspices of the U. S. Bureau of the Budget (1957 Manual), has been adopted for the industry groupings and carried back to 1947.

(8) The year 1957 has been selected as a more recent and more appropriate period for weighting purposes. For the period beginning with January 1953, individual series in the revised index have been combined with weights based on value-added price relationships in 1957. For the period January 1947-December 1952, the 1947 price relationships have been used, as they were in the 1953 revision of the index.

(9) The year 1957 has also been selected as one of two comparison base periods. Publication on the 1947-49 comparison base period will be continued for the revised total index and its major groupings to permit ready comparison with other general purpose indexes using that base. The underlying series have been compiled in this revision with the average for the year 1957 equal to 100. These and the major groupings will be published regularly on this base to facilitate analysis of production in terms of a more recent period, pending adoption of a new base by Federal agencies generally.

The revised index reveals more growth over the postwar period, especially from the end of 1950 to mid-1955, and it shows wider cyclical movements since 1952. In both May and June of this year, before the steel strike, the revised total index for manufacturing and mining is 162 percent of the 1947-49 average, as compared with the previously published level of 153 in May and the peak of 155 in June for the old index. The new total index is 166 for both May and June. About one-third of this midyear increase reflects the broadening of coverage to include electric and gas utility output, and the remaining two-thirds reflects the adjustment of production series to new benchmarks and the development of a number of new monthly series.

The revisions are shown for the total index and for summary groupings of industry and market series in the December issue of the Federal Reserve Bulletin. The tables include annual and seasonally adjusted monthly data on both the 1947-49 and the 1957 comparison base periods. Seasonally adjusted indexes for a combination of the revised manufacturing and mining divisions are also shown on a 1947-49 base for comparison with the

old total index. Beginning with the January 1960 issue, the Bulletin will show figures for the total index and for major industry and market groupings seasonally adjusted and unadjusted, but not for most individual series.

Detailed descriptive material and statistical tables on the 1959 provision will be provided in a separate publication, which will be available this spring at $1.00 a copy from the Federal Reserve Board, Washington 25, D. C.

—Clayton Gehman, Chief, Business Conditions Section, Division of Research and Statistics, Board of Governors of the Federal Reserve System

1960 Census of Housing: The Components of Change and Residential Finance Programs

Numerous requests for data both on housing inventory changes and on the financing of residential properties have led to development of a survey incorporating both programs as part of the 1960 Housing Census. The combined Survey of Components of Change and Residential Financing (popularly known as SCARF) went into the field in October 1959 and is being processed on schedule at Jeffersonville, Indiana.

The Components of Change part of the program is similar to the National Housing Inventory of 1956 and is designed to provide information on changes in the housing inventory (new construction, other additions, conversions, mergers, demolitions and other losses) which have occurred since 1950 for the United States and 17 standard metropolitan statistical areas (SMSA's). The 17 SMSA's include the 9 used in the 1956 National Housing Inventory (Atlanta, Boston, Chicago, Dallas, Detroit, Los Angeles, New York-Northeastern New Jersey, Philadelphia, and Seattle), for which data will also be provided on changes since 1956; and 8 additional SMSA's with a population of one million or more in 1950 (Baltimore, Buffalo, Cleveland, Minneapolis-St. Paul, Pittsburgh, St. Louis, San Francisco-Oakland, and Washington, D. C.

The 1959 Components of Change survey will use the term "dwelling unit" as the unit of enumeration. Thus, the 1959 comparison with 1950 and 1956 housing inventories will be made with a common measure. In the 1960 Housing Census, however, the new concept of "housing unit" will be employed as the unit of enumeration. It is believed that the use of "housing unit" will provide more consistent and complete coverage of the housing inventory.

In order to obtain a more accurate new construction figure, the total inventory figure obtained in the 1960 Housing Census will be used for ratio estimating purposes. This procedure also will require a Phase II re-enumeration of the Components of Change segments immediately after the 1960 Census to obtain the count of housing units in those segments. The latter figure plus the total count of housing units for the Nation will provide the 1960 factors for the ratio estimating procedure.

It is planned to obtain a reconciliation of the dwelling unit figure from the 1959 enumeration and the housing unit figure from the 1960 Census through the Bureau's 1960 Census Evaluation Program. The reconciliation should account for the actual changes which occurred between the two enumerations as well as changes attributable to the use of the new definition.

The Residential Finance part of SCARF is designed to up-date information from the 1950 Residential Finance and 1956 Owner-Occupied Properties programs. Data for properties with and without mortgages will be provided for the Nation, regions, inside and outside standard metropolitan statistical areas. The type of information to be collected will be:

a. *Mortgage characteristics.*—Magnitude and characteristics of outstanding debt, amount and term of loan, interest rate, government insurance status, presence of junior mortgage, amount of mortgage payments, and type of lender.
b. *Property characteristics.*—Value, purchase price, year built, year acquired, number of units in property, and condition.
c. *Owner characteristics.*—Sex and age of head by type of family, veteran status, income, color, etc.

As in the 1960 Census, the information will be obtained by the use of three self-enumeration questionnaires: (1) Homeowner Questionnaire—filled by owner-occupants of the property; (2) Rental Property Questionnaire—filled by owners of rental properties; and (3) Lender Questionnaire—filled by lenders on mortgaged properties.

The households selected for this program will be the same as those in the Components of Change Survey, and will include about 40,000 households. Approximately 10,000 large rental properties containing 50 or more units also will be included in the survey to provide statistics for this type of property.

—Frank S. Kristof, Assistant Chief, Housing Division, Bureau of the Census, Department of Commerce

Among Recent Publications—

The Compilation of Manufacturing Statistics by Frank A. Hanna, Professor of Economics, Duke University, issued by the Bureau of the Census, Department of Commerce. A comprehensive description of the whole process of compiling statistics on manufacturing, from the determination of program content through the collection and processing of the data to the final publication and distribution of the results. The book was designed to serve needs expressed by users of Census data in trade associations, universities, research organizations, and elsewhere for a comprehensive, up-to-date treatment of this subject to supplement and integrate the information given in notes, definitions, and appendixes ordinarily included with published statistics and

to augment available documentation on conceptual and procedural aspects of manufacturing statistics. In preparing the book Dr. Hanna had access to source documents and internal working memoranda of the Bureau of the Census and to special data compilations required for the purpose. Available (233 pages, clothbound) at $1.75 a copy from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Historical Comparability of Census of Manufactures Industries, 1929-1958 by Harold T. Goldstein, issued by the Bureau of the Census as Working Paper No. 9. Explains the extent of comparability among industries covered in the reports issued for the censuses of manufactures from 1929 to 1958 and describes the nature of the adjustments necessary to attain comparability for a large segment of the manufacturing industry universe. The report also relates each of the approximately 430 industry classifications used in the 1958 census to comparable categories used in the 1929-54 censuses, showing which industries or parts of industries (usually products) listed in these prior census reports constitute the classifications used in the 1958 census reports. Actual industry statistics on a comparable basis for this period are not presented. Available (63 pages $1.00) from the Bureau of the Census, Washington 25, D. C., or from field offices of the Department of Commerce.

Consumer Prices in the United States, 1953-58 (BLS Bulletin No. 1256) issued by the Bureau of Labor Statistics, Department of Labor. Continues the series of historical records covering the years from 1913 forward. Contains an analysis of price movements of consumer goods and services during the 6-year period, 1953-58; a section describing the history and development of the Consumer Price Index (CPI); a section discussing various technical aspects of the CPI; and tables of indexes for the years 1953-58 and earlier for the U.S. city average and each of 20 large cities, as well as data which have appeared in individual monthly CPI reports and articles in the Monthly Labor Review. Available (126 pages, 65 cents) from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Wholesale Prices and Price Indexes, 1958 (BLS Bulletin No. 1257), issued by the Bureau of Labor Statistics, Department of Labor. New edition of a series which started in 1900, containing an analysis of price movements of primary market prices during 1958; a brief description of the Wholesale Price Index (WPI); and tables of indexes and prices for the year 1958. Much of the data has been published in monthly WPI reports and in the Monthly Labor Review. Available (310 pages, $1.50) from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Occupational Outlook Handbook, 1959 edition (BLS Bulletin No. 1255), issued by the Bureau of Labor Statistics, Department of Labor. Revision and expansion of this comprehensive reference book, with up-to-date information on about 600 occupations and 30 major industries, including new sections on technicians, programmers, school counselors, sales occupations, driving occupations, and instrument repairmen; and on the baking industry, the paper industry, and the aircraft, missile and spacecraft field. The report on each occupation describes the nature of the work, the employment outlook, training, requirements for entry positions, lines of advancement, where the jobs are located, earnings, working conditions, and where to obtain further information. Available (800 pages, $4.25) from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Health Statistics from the U.S. National Health Survey, issued by the Public Health Service, Department of Health, Education, and Welfare. First report in Series C, which will present statistics for special population groups based on data collected in the Health Survey's continuing household-interview program. Series C-1, "Children and Youth, Selected Characteristics, United States, July 1957-June 1958" brings together selected summary statistics related to acute conditions, persons injured, impairments, limitation of activity and mobility, disability days, hospital discharges, physician visits, and dental visits for persons under 25 years of age. References are included to the Series B reports which give greater detail for each subject. Available at 35 cents a copy from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Funds for Research and Development in the United States, 1953-59 (Reviews of Data on Research and Development, No. 16), issued by the National Science Foundation. Reports on funds expended on the performance of research and development by the four sectors of the economy (Federal Government, private industry, colleges and universities, and other nonprofit institutions). Funds expended on R & D in the United States rose from an estimate of more than $5 billion in 1953-54 to a projected estimate of $12 billion in 1959-60. Available at 10 cents a copy from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

The Federal Research and Development Budget, Fiscal Years 1958, 1959 and 1960 (Federal Funds for Science, No. VIII), issued by the National Science Foundation. Annual publication on the Federal research and development budget, with data supplied by the agencies. The current analyses introduce revisions in the definitions and identification of funds, and the estimates for 1958 and 1959 are given on both the revised and the unrevised bases in order to facilitate comparison with previous estimates. Information on the performers of the Government's basic research is presented for the first time, and the obligations for basic research are also reported by scientific fields, Available at 45 cents a copy from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

GOVERNMENT OF CANADA STATISTICAL ACTIVITIES

Programme of the Judicial Section—DBS

The Judicial Section of the Dominion Bureau of Statistics is undertaking the redevelopment of its crime and correctional statistical series to meet new requirements for data. The work of the Section is being reorganized and the staff expanded to meet these needs. Interest in the programme is widespread and several associations have appointed committees including a DBS representative to define their requirements for statistical information. Among these associations are the following: Canadian Association of Chiefs of Police, Committee on the Uniform Recording of Police Activities, Canadian Conference of Training Schools, Committee on Statistics and the Canadian Corrections Association, Committee on Records, Statistics and Research.

W. A. Magill
Health and Welfare Division—DBS

Some Statistics on Education in Canada

Series of statistical reports on vocational education and training covering trade schools, secondary vocational education, and post secondary technical training will be made available during 1960 for the first time by the Dominion Bureau of Statistics.

It is expected that the first annual report on adult education services provided by school boards, government departments and universities will be available by spring of 1960.

"University Entrance Awards, 1960", a greatly increased volume, will be available by spring to complement "Awards for Graduate Study and Research, 1959", which listed almost 1,200 separate items dealing with fellowships offered by Canadian and outside organizations.

Fred E. Whitworth, Ph.D.
Education Division—DBS

Plans for the 1961 Census of Canada

On June 1, 1961 the enumeration of Canada's Tenth Decennial Census since Confederation in 1867 will get under way. Some 30,000 trained enumerators will start out on their rounds of visitation on that day. The scope of the 1961 Census will include questions on population, housing, agriculture, forestry, merchandising and service establishments. With a view to reducing costs, sampling will be used where it will provide a sufficient amount of detail. The sample will consist of every 5th household and farm visited by the enumerator. All housing questions will be sampled, as well as certain questions on population and agriculture.

Processing operations will revolve around the use of a computer operating with magnetic tapes and capable of editing, sorting, counting, and printing out the results. Input to the computer will be through a document reader which operates on the photo-electric cell principle. Extensive use will be made of the Bureau's eight Regional Statistics Offices in the administration of the field work, and in the initial checking of the census returns. The over-all planning of the 1961 Census is being conducted in the Dominion Bureau of Statistics under the direction of a Census Executive Committee with the Dominion Statistician as Chairman. A number of working committees (e.g., Field Organization, Publicity, Training, Population, Housing, Agriculture, etc.) meet regularly and report to the main Committee on their recommendations in their particular fields.

Results of the 1961 Census will start to become available within the first few months after the census date of June 1. Preliminary population totals will be issued at that time for all cities, towns, villages and rural municipalities. Final counts of population, (after adjustments for temporary residents, persons reporting they were missed, etc.) will be issued for Canada and the provinces, counties, cities and towns, etc., early in 1962. These will be followed by basic distributions on the population such as age, sex, marital status, and so on. At the same time the results of the Censuses of Agriculture and Housing will start being issued. From that time through to 1963 and beyond, a wealth of statistical information on Canada's people, homes, farms and businesses will become available to the many users requesting up-to-date figures on these subjects. Another inventory of Canada's human and material resources will have been compiled, which will form the background of factual knowledge for the conduct of much of the nation's affairs.

D. L. Ralston,
Census Division—DBS

STATISTICS AND EDUCATION FOR BUSINESS*

by Maurice W. Lee

University of North Carolina

Although I have been and am now a member of the American Statistical Association, I am no statistician. This is a point well understood by those of you who know me well. For those who do not, I might clarify my position by telling you that my participation in the affairs of the Association has been pretty much that of a consumer. In recent years I have been a rather faithful reader of your outstanding *Journal* and have occasionally understood what I have read. But I have made no contributions to the field of statistics and your program planners have not invited me to participate in the program of the American Statistical Association as a statistician. Rather, I should judge, they have felt it appropriate that a dean, having some measure of responsibility in the economics and business area, should be invited to entertain you with his rather limited views of the role of statistics in these fields, and particularly in relation to professional education for business.

General Views

In order to arouse your combative instincts at once let me throw out a general thesis which I shall hold hereafter. It is the proposition that statistics be eliminated from the undergraduate business administration curriculum. And as an extension of this thesis let me advance the further suggestion that most of what is now taught as statistics in the graduate business curriculum should also be eliminated therefrom.

I take this position, not because I think that statistics is unimportant in the training of potential business executives, but rather for quite the reverse reason—because I think it is much too important to be handled as it now is. I suggest a rather convincing case may be made for the proposition that statistics as now taught and as now established in both undergraduate and graduate business curricula is a waste of everybody's time. The undergraduate already has too little time to get a broad liberal education. And most undergraduate statistics courses contribute little to the breadth of his educational experience. Moreover undergraduate statistics courses taken by business administration students are generally neither taught nor learned so as to make their content a useful special field tool. If the course is neither a part of the broad educational experience of the undergraduate nor a useful tool, what justification has it?

For the graduate student (take the typical candidate for a master of business administration degree) there is already either no requirement in statistics or a unit of concentrated techniques instruction is packaged without much attempt to relate it to anything else which is happening to him.

What of the faculty member? Is his time also wasted in the teaching of these statistics courses? Clearly, if he is a competent statistician, it is and he would be better employed in other activities. If he is not a competent statistician—and too often he is simply the holder of the short straw in a draft arrangement which the dean or department chairman is compelled to arrange in order to produce an instructor for a required course—he is probably doing more mischief in the statistics class than he would in some other assignment.

Now these are rather extreme views and I am reconciled to the fact that they will not go unchallenged but I would like to turn from the matter of statistics to the more general matter of collegiate education for business since a general understanding of this subject is an essential part of the background needed for any discussion of statistics and education for business.

Education for Business—General Observations

The field of education for business is a dynamic one. Collegiate education for business has been undergoing the most searching of reexaminations since the end of World War II. The American Association of Collegiate Schools of Business, in its statement of standards, has urged upon member schools an attitude of experimentation and critical examination of established approaches to such education. The Ford Foundation and the Carnegie Foundation have both suppported significant studies of collegiate education for business at graduate and undergraduate levels.[1] A considerable number of the business schools have undertaken thorough reappraisals of their own work. The field of collegiate education for business is an exciting and interesting field today.

But this was not always the case. By the end of the thirties collegate education for business had pretty well settled down into some well worn grooves which were being cut deeper and deeper with the passage of time. The basic core fields had been well outlined by the pioneers of the preceding generation. Their successors had progressively subdivided these cores and by the end of the thirties were requiring the business student to take sizeable amounts of this fragmented, "practical-business" curricular offering at the expense of broad educational experience in the arts and sciences and the basic tool courses.

---

* This paper was presented at the 118th Annual Meeting of the American Statistical Association, December, 1958.

[1] The reports of these studies have been published since this paper was prepared. See Robert A. Gordon and James Edwin Howell, *Higher Education for Business* (New York, 1959) and Frank C. Pierson (and others), *The Education of American Businessmen* (New York, 1959).

Although here and there across the country a few schools were analyzing their offerings critically, for the most part collegiate education for business had settled, by the end of the 1930's, into a dreary pattern of descriptive-informational courses with little academic content. Graduate students and undergraduates mingled in courses which provided little challenge to any of them. Undergraduate business curricula had come adrift in a sort of academic sargassen sea where the student was caught up in the tentacles of fragmented special field concentrations which he believed—and the faculty did nothing to disabuse him of this belief—were making him a skilled specialist in some field of business. This was, of course, nonsense. At best he had a command of the cliches and outmoded techniques of one field. And even at this best he had paid a real price in general illiteracy and illiteracy even about the overall field of business. The diluted fragmentation of his special field courses had given him a diet of intellectual pap so watered down as to provide nothing more than a gentle embalming fluid for his mental processes.

Now this sort of bludgeoning of the pre-war business administration curriculum by a present-day business school dean is not a form of self flagellation indulged in for the good of this dean's soul. It has more immediate point as an explanation of the role, even today, of the statistics course(s) in the business administration curriculum. With so much pap and debris in the business curricula proper business school faculties needed a few courses, required of all business students, which could be pointed to as "rigorous." In most schools accounting, economics, and statistics served these purposes—and for a time it even appeared that business schools were going to put in their own watered down economics courses so that this stumbling block would be removed for their students.

Statistics and accounting both had a certain background in quantitative methodology. And because students were generally inadequately prepared in mathematics when entering college such subjects became traumatic spots in the curriculum. Even the faculties were not well enough grounded in mathematics to escape a good part of this feeling. It is arguable that these courses and, for present purposes since we are here to talk about the statistics course, let us say the statistics course was kept in the undergraduate business administration curriculum primarily because it provided at least one high hurdle for the student who was pursuing a degree through a curriculum which had become almost a down-hill run.

Statistics in the Undergraduate Curriculum

The contention that the builders of undergraduate business administration curricula have kept the statistics course as a requirement for the degree primarily because it was a "hard" course in an otherwise generally unchallenging program will itself be challenged by many, I am certain. And it is true that an occasional business school dean will include some favorable comment about the importance of work in statistics when he is addressing an entering class of new majors in the school. Also faculty members, when talking to student groups, quite frequently suggest the importance of such training.

But candor also notes that the staff member when meeting with individual students, perhaps as the student's advisor, often counsels or at least agrees with the student that the statistics course might well be deferred another semester when he will perhaps have a lighter load. I would like to see the results of a survey which would determine when in the student's academic life the statistics course is generally taken. I would not be surprised to find that a very large proportion of the business administration majors take this course in their senior year. And a not inconsequential number take it in their eighth semester when further postponement is no longer possible.

All of this suggests that the statistics course, in the undergraduate curriculum, may play a role comparable to that of the foreign language requirements in many a doctoral program. The statistics course tends to be taken toward the very end of the student's business administration program. It is approached not as a useful tool but as an artificial hurdle in the degree program. As such it has about the same quality of usefulness to the student either in his formal education or in his post degree experience.

The average faculty in business administration makes about the same degree of use of the statistical tool as the average graduate faculty does of the foreign languages so often required of its doctoral candidates. Many of the faculty are themselves no more adept in statistical methodology and thought than they are in the day to day use of foreign languages in their subject matter fields. As a consequence, very little which happens to the student in his courses in accounting, marketing, finance, or personnel gives him any reason to feel that advance knowledge of statistics is indispensable to his performance in special field courses.

The combination of all these circumstances, i.e., the reputed difficulty of the statistics course, lack of faculty emphasis upon its vital tool nature, and absence of much statistical content in other business school courses, leads inevitably to the conclusion that the student would be well advised to use the hours now tardily given over to the undergraduate statistics course for attendance at the sessions of almost any other subject offered by the university.

The Appropriate Role for Statistics in the Undergraduate Business Administration Curriculum

None of the foregoing is intended to suggest that statistics should not play a vital role in undergraduate business education. It should. But before turning to a consideration of *how* this might be done, let us first consider *what* the role of the statistics course(s) might be.

I rather suspect that the role of the statistics course is pretty much the same for all undergraduate curricula, save that in statistics itself. For present purposes let us concentrate on its role in the undergraduate business curriculum. Let us assume also that not more than one such course is to be required of all the undergraduate business administration majors. What should that course seek to do? Perhaps a first approach to answering this question would lie in the inverse approach—in a stipulation of what it should not do.

The elementary statistics course for business administration majors should not attempt to train statisticians. By this I mean that the emphasis should not be upon the techniques and the details of various statistical methodologies. Stated affirmatively and, I am certain, quite obviously, the course should be oriented toward the consumer and not toward the producer of statistics. As a potential businessman the undergraduate major in business administration should emerge from this course with some insight concerning both the power and the limitations of statistical methods. He should understand, as a potential business executive, that it is the great function of statistics to narrow the range of uncertainty which surrounds the decision making process.

The art of management, which is at the center of this whole matter of business administration, is basically the art of making decisions in the face of uncertainty. The reduction of uncertainty is an essential part of the process of improving the quality of executive decisions. And statistics is primarily a set of methods for reducing uncertainty. This is the point of view which should emerge, for the business administration student, as he completes his course in statistics.

Viewed in this fashion statistics ceases to be a near-meaningless obstacle on the road to the baccalaureate degree and becomes an important tool for coming to grips with the fascinating central problem of business administration training—the decision making process. Furthermore its application to all levels of the managerial process and to all of the functional fields of business may be made quite apparent to the student. Instead of the rote memorization of formulae and routine and time consuming drills in the isolation of seasonal, secular, cyclical and random components of time series the student can, with this different approach, find statistics an exciting and immediately useful tool for his whole academic program.

Revitalizing the Statistics Course in the Undergraduate Curriculum

After this brief digression designed to throw light on an appropriate role for the statistics course, we return to the main theme. As a resume of points already made, we have concluded that the statistics course, as required, administered, and taught in the curricula of most undergraduate business administration programs is a waste of everybody's time. At the undergraduate level the statistics course is in much the same position as the foreign language requirements of too many doctoral programs. It comes too late in the student's educational program; its relevance is not made clear to him by anything which happens elsewhere in the curriculum; the traditional course is a burdensome exercise in formulae memorization and deadly repetition of routine, dreary, data-processing exercises.

How best to correct this condition? It is here that we return to the general thesis advanced at the beginning of this paper—the proposal that statistics be eliminated from the undergraduate business administration curriculum forthwith. I suspect that you, as practicing statisticians will greet this with something of the enthusiasm a union meeting might greet a company announcement of plans to procure some great new labor saving machine. But I am not proposing that the elimination of the statistics course be accompanied by the elimination of statistics instructors.

It is suggested that the statistics instructors, relieved of their formal duty to teach the undergraduate statistics course, now be given responsibility for a statistics workshop to run throughout the year. The leadership of this workshop shall be given to the statistics instructors but the participants shall be the non-statistics members of the business administration faculty. During the first part of this academic-year-statistics-workshop the faculty might be given pretty much the same course as that given heretofore to the student body. During the remainder of the year the participants and workshop leaders would be expected to develop a revised course along the general lines suggested in the preceding section.

This statistics workshop would provide solutions to most of the major conditions which have reduced present day statistics offerings to meaningless status. First the statistics faculty would have the active help and assistance of the rest of the faculty in a retooling of the course in more meaningful directions. Secondly, as active participants in the workshop, the faculty in busiess administration would now develop competence of its own in the use of statistical methods and new insights into ways in which such methods can be brought to play in each of their own fields—in accounting, finance, marketing, production, and personnel.

For the second year of this experimental design it is proposed that the undergraduate statistics course be reactivated. This, however, would be a totally different course than the old one which was discontinued. In this second year it is not proposed that the new course be required of all majors but that it be urged strongly upon new students entering or about to enter upon their business administration program, preferably at either the sophomore or junior year level.

For the other business administration faculty members who will have completed their year of participation in the statistics workshop, this second year will be one for new approaches to the tool and functional fields of business. By the end of the second year, the insights provided through the statistics workshop should have begun to permeate the entire curriculum. The statistics

course can then be restored as a requirement for students at the very beginning of their business administration programs.

This may seem like a long way around to reach an appropriate concept of statistics in the undergraduate business curriculum. It is the shortest way I can think of for meeting head-on the primary sources of difficulty, 1) the technique and detail-laden nature of present courses, 2) the general lack of sympathy and understanding shown by the rest of the business administration faculty, and 3) a consequence of the first two, the failure to employ the insights of statistics in the rest of the curriculum.

This moratorium-workshop-rebirth method embraces about the only approach through which major changes can be quickly accomplished in a university framework —through the participation and active planning and involvement of the faculty itself.

Statistics in the Graduate Business Curriculum

For reasons which need not be debated here I am prepared to make the assumption that most students entering the graduate M.B.A. program do so with little or no statistical training in their background. The M.B.A. program is a professional program. As such it must come to grips with the analytical thought processes which are central to the managerial concept. I do not propose to review all that goes into this matter. Essentially the problem involves the determination of what should be decided, the decision process itself, and the execution of decisions. I could spend a great deal of time on the behavioral aspects of these matters but our agenda today calls only for the consideration of the role of statistics in the M.B.A. program.

From what has been said in the previous paragraph and on the preceding pages of this paper in connection with the undergraduate program it is clear that statistics has an important role to play in the M.B.A. program. But it is also clear that in the case of many, and perhaps most, M.B.A. programs, statistics is either not required or again, as in the case of the undergraduate program it is a *pro forma* requirement, not meaningfully integrated as an important part of the program. And, by and large, the bulk of the graduate faculty give little indication, in their own courses, of any meaningful understanding of the methodology of statistics and its application to their own fields.

Little will be lost in most present-day M.B.A. programs if the energies of the statistics faculty are diverted from the teaching of these current statistics courses to a more meaningful exploration of the role and content of the statistics courses in the M.B.A. program. What I suspect is even more appropriate is an exploration of the role of the quantitative methods, including statistics, in the M.B.A. program. This, I think, is a matter of some urgency at the present time.

We are in the early stages of a technological revolution with tremendous implications for management training (the central function of the M.B.A. program). I am referring to both methodological applications of statistics to the business field and to the electronic computers which make these applications practical. It is impossible to predict just what course these developments will take. But it is clear that the process of decision making will be vitally affected. Tactical decisions will more often be reduced to routines which can be handled by mathematical programs. Strategic decisions will be closely studied and converted to tactical level where possible.

In short, without in any way minimizing the other aspects of managerial training, it is apparent that managers of the future will need a greater understanding of quantitative methods. This does not mean that they need more of the traditional courses in statistics or accounting. What is needed is a more fundamental approach which is disassociated from the courses appropriate to the training of statisticians and accountants.

Hopefully, some years hence, our M.B.A. candidates will enter graduate business programs with a strong background in finite mathematics, a measure of understanding of matrix theory, differential and integral equations and the like. For the immediate future a transitional plan must be devised which will instill in such candidates an appreciation of the scope and range of business applications of quantitative methods.

Statistics, it seems to me, belongs in the M.B.A. program not as statistics but as one part of a broader quantitative tool course embracing contributions which flow out of the areas of competence of the statisticians, accountants, and economists. It behooves us to provide time and encouragement for faculty members in these three areas to work with their colleagues from the functional business areas in the development of such courses for the immediate future. It should be noted that at least two of the currently announced Ford Foundation programs are designed to encourage this sort of growth and thinking on the part of business school faculties.

Future Annual Meetings of ASA are as follows:

YEAR	*PLACE*	*HEADQUARTERS*	*DATES*
1960	PALO ALTO, CALIF.	STANFORD UNIVERSITY	AUGUST 23-26
1961	NEW YORK CITY	ROOSEVELT HOTEL	DECEMBER 27-30
1962	MINNEAPOLIS	LEAMINGTON HOTEL	EARLY SEPTEMBER
1963	CLEVELAND	CASE INST. OF TECH. AND WESTERN RESERVE UNIV.	EARLY SEPTEMBER

THE RELATION BETWEEN CONFIDENCE INTERVALS AND TESTS OF SIGNIFICANCE

— A Teaching Aid —

by Mary G. Natrella, *National Bureau of Standards*

1. Introduction.

The advertising sheet for a recent revision of a classical text book on statistical methods states "The author has diverted emphasis from tests of significance to point and interval estimates." This author is not alone. Many statistical consultants, analyzing an experiment for the purpose of testing a statistical hypothesis, e.g., in comparing means of normal populations, find that they prefer to present results in terms of the appropriate confidence interval.

It must be noted of course that not every statistical test can be put in the form of a confidence interval. Kendall, [5], for example, speaks of two broad classes of statistical tests, "those which give a direct test of a given value of a parent parameter, and those which do not." Berkson [2] also distinguishes these two classes of tests in discussing tests of normality and says "I suggest tentatively that the two classes I have in mind can be differentiated as (1) those which in principle can be alternatively stated in terms of an estimate and its confidence interval and (2) those which cannot be so stated." It is this first class of tests which will be discussed in this paper. Tests such as tests of normality, tests of goodness-of-fit, and tests of randomness fall into the second class.

When the results of a statistical test can alternatively be stated in terms of a confidence interval for a parameter, is there any reason to prefer the confidence interval statement? An early indication of dissatisfaction with the logic of tests of significance as experimental evidence is given in another paper by Berkson [3]. He stresses the point that experimenters are not typically engaged in disproving things, but are looking for evidence for affirmative conclusions, and that after rejecting the null hypothesis, they will then look for a reasonable hypothesis to accept. The relation between confidence intervals and tests of significance is mentioned only briefly by most textbooks, and ordinarily no insight is given as to which conclusion might be more appropriate. (A notable exception is Wallis and Roberts [7].)

In the present note, we draw attention to how these two approaches are related and how they differ. One reason for preferring to present a confidence interval statement (where possible) is that the confidence interval, by its width, tells more about the reliance that can be placed on the results of the experiment than does a YES-NO test of significance. Of course, a test of significance, when accompanied by its appropriate Operating Characteristic curve, provides much the same kind of information as does a confidence interval. In practice, however, the associated O.C. curve is often ignored by and may be unknown to the experimenter. We feel that the experimenter himself finds the confidence interval more natural and more appealing, but generally has little notion of how the two concepts are related.

2. An Example.

Let us review both procedures with reference to a numerical example.

For a certain type of shell, specifications state that the amount of powder should average 0.735 lb. In order to determine whether the average for the present stock meets the specification, twenty shells are taken at random and the weight of powder is determined. The sample average ($\overline{X}$) is 0.710 lb. The estimated standard deviation (s) is 0.0504 lb. The question is whether or not the average of present stock differs from the specification value. In order to do a two-sided test of significance at the $(1-\alpha)$ probability level, we compute a critical value, to be called for example, C. Let $C = \frac{t^* s}{\sqrt{n}}$

where t^* is the positive number exceeded by $100\left(\frac{\alpha}{2}\right)\%$ of the t-distribution with $n-1$ degrees of freedom.

In the example above with $\alpha = .05$, $t^* = 2.09$, $C = 0.0236$ lb. The test of significance says that if $|\overline{X} - 0.735| > C$, we decide that the average for present stock differs from the specified average. Since $|0.710 - 0.735| > 0.0236$, we decide that there *is* a difference.

We can also compute from the data a 95% confidence interval for the average of present stock. This confidence interval is $\overline{X} \pm C = 0.710 \pm 0.0236$ or 0.686 to 0.734 lb. The confidence interval can be used for a test of significance; since it *does not include* the standard value 0.735, we conclude that the average for the present stock *does differ* from the standard.

Comparisons of two materials (both means unknown and equal variances) may be made similarly. In computing a test of significance we compare the observed difference $|\overline{X}_A - \overline{X}_B|$ with a C' (a computed critical quantity similar to C above). If $|\overline{X}_A - \overline{X}_B|$ is larger than C' we declare that the means differ significantly at the chosen level. We also note that the interval $(\overline{X}_A - \overline{X}_B) \pm C'$ is a confidence interval for the difference between the true means $(\mu_A - \mu_B)$. If then this interval does not include zero, we conclude from the experiment that the two materials differ in mean value.

3. Do the Two Approaches Differ?

Here then are two ways to get the same answer to the

original question. We may present the result of a test of significance, or we may present a confidence interval. Are there any differences between the two? The significance test is a "go no-go" decision. We compute a critical value C, and we compare it with an observed difference. If the difference exceeds C, we announce a "difference"; if it does not, we announce no "difference." If we had no OC curve for the test, our decision would be a yes-no proposition with no shadowland of indifference. The test may say NO, but only the OC curve can qualify this by saying that this particular experiment had only a ghost of a chance of saying YES to this particular question. For example, see Fig. 2. If the true value $d = \left|\frac{\mu_1 - \mu_0}{\sigma}\right|$ is equal to 0.5, a sample of 10 is not likely to detect a difference, but a sample of 100 is almost certain to.

Using a rejection criterion alone is not the proper way to think of a significance test. One should always think of the associated OC curve as part and parcel of the test. Unfortunately this has not always been the case, and the significance test without its OC curve has distorted the thinking in some experimental problems. As a matter of fact many experimenters who use significance tests are using them as though there were no such thing as an OC curve. For this reason, it may be preferable for the experimenter to approach the problem of testing hypotheses by using confidence intervals.

4. Why Prefer the Confidence Interval?

A confidence interval procedure contains information similar to the appropriate OC curve, and at the same time is intuitively more appealing than the combination of a test of significance and its OC curve. If the standard value is contained in the confidence interval, one can announce "no difference." The *width* of the confidence interval gives a good idea of how firm is the Yes or No answer.[1]

Suppose that the standard value for some property is known to be 0.735, and that a $100(1-\alpha)\%$ confidence interval for the same property of a possibly different material is determined to be 0.600 to 0.800. It is true that the standard value is in the interval, and that we would say that there is no difference. All that we really know about the new product, however, is that its mean probably is between 0.6 and 0.8. If a much more extensive experiment gave a $100(1-\alpha)\%$ confidence interval for the new mean of $0.60 - 0.70$, our previous decision of no difference would be reversed.

On the other hand, if the computed confidence interval, for the same confidence coefficient, had been .710—.750, our answer would still have been "no difference", but we would have said "No" more loudly and firmly. The confidence interval not only gives a Yes or No answer, but also, by its width, gives an indication of whether the answer should be whispered or shouted.

This is certainly true when the width of the interval, for a given confidence coefficient, is a function only of n and the appropriate dispersion parameter (e.g., known σ). When the width itself is a random variable (e.g., is a fixed multiple of s, the estimate of σ from the sample), one can occasionally be misled by unusually short or long intervals. But the *average width* of the entire *family* of intervals associated with a given confidence-interval procedure is a definite function of the appropriate dispersion parameter, so that *on the average* the random widths do give similar information. See [1] for a graphical illustration of confidence intervals computed from 100 random samples of $n = 4$ (actually random normal deviates).[2] Figure 14 in reference [6] shows a similar illustration of 100 intervals for $n = 4$, and in addition shows 40 intervals for $n = 100$, and 4 intervals for $n = 1000$. The fluctuation in size and position is of course very much reduced in the latter cases.

The significance test gives the same answer, and a study of the OC curve of the test indicates how firm is the answer. If the test is dependent on the value of σ, the OC curve has to be given in terms of the unknown σ, In such a situation, one has to make use of an upper bound for σ in order to interpret the OC curve, and again one may be misled by a poor choice of this upper bound. On the other hand the *width* of the confidence interval is part and parcel of the information provided by that method. No *a priori* estimates need be made of σ as would be necessary to interpret the OC curve. Furthermore, a great advantage of confidence intervals is that the width of the interval is in the same units as the parameter itself. The experimenter finds this information easy to grasp, and to compare with previous information he may have had.

5. What does the Confidence Interval Show?

The most striking illustration of information provided by confidence intervals is shown in the charts of confidence limits for a binomial parameter. In this case the limits depend only on n and the parameter itself, and one cannot be misled in an individual sample. Figure 1 shows the "central" 95% confidence limits for proportions. These "central" limits are the well-known Clopper-Pearson limits, such that each tail probability is not greater than .025. The central limits correspond to an equal-tail significance test at the $(1-\alpha)$ probability level, and to each of the two "central" limits there corresponds a single-tail significance test at the $(1-\alpha/2)$ probability level. In constructing a system of confidence limits there is no unique method of subdividing between the two tails. Limits which are not "central" may have other optimum properties—e.g., the recently-developed system of E. L. Crow [4] gives limits which are shorter than the "central" limits.

Suppose that a new item is being tested for comparison with a standard. In a sample of 10 we observed two

[1] There is a caution in this regard as explained a little further on.

[2] This picture is an excellent teaching aid in itself. Despite the fluctuation in size and position of the individual intervals, a proportion of the intervals remarkably close to the specified proportion do include the known population average. If σ were known rather than estimated from the individual sample, the intervals would fluctuate only in position, of course.

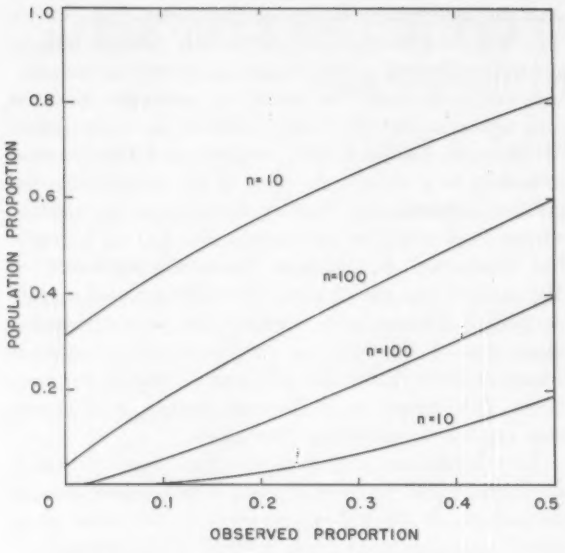

Fig. 1 95% Confidence Limits for Population Proportion

defectives and therefore estimate the proportion defective for the new item as 0.20. The central 95% confidence interval corresponding to an observed proportion of 0.20 ($n=10$) is 0.02 — 0.56. Assume that the known proportion defective for the standard (P_0) is 0.10. Our experiment with 10 gives a confidence interval which includes P_0, and therefore we announce "no difference" between the new item and the standard in this regard. Intuitively, however, we feel that the interval 0.02 — 0.56 is so wide that our experiment was not very indicative. Suppose then we test 100 new items and observe 20 defectives. The observed proportion defective is again 0.20. The confidence interval now is 0.13 — 0.29, and does *not* include $P_0=0.10$. This time we are forced to announce that the new item "is different" from the standard, and the narrower width of the confidence interval (0.13 — 0.29) gives us some confidence in doing so.

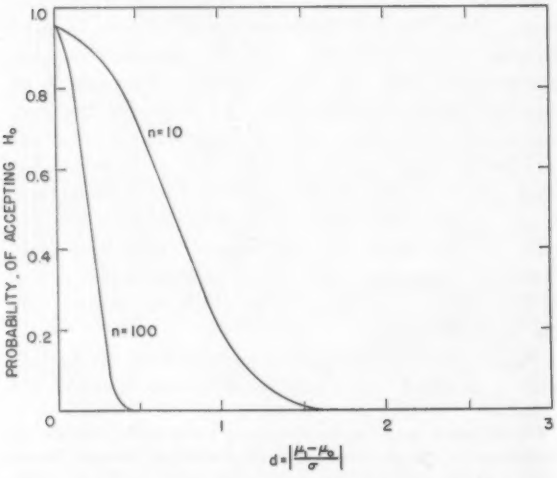

Fig. 2 Operating Characteristics of the Two-Sided t Test ($\alpha=0.05$)

6. What does the Operating Characteristic Curve Show?

The foregoing has shown that it is possible to get some notion of the discriminatory power of the test from the size of confidence intervals. Is it also possible in reverse, to deduce from the OC curve what kind of confidence interval we would get for the new mean? Although we cannot deduce the exact width of the confidence interval, we can infer the order of magnitude. Suppose that we have measured 100 items, have performed a two-sided t-test (does the average μ_1 differ from μ_0?), and have obtained a significant result. Look at the curve for $n=100$ in Figure 2, which plots the probability of accepting H_0 (the null hypothesis) against $d=\left|\frac{\mu_1-\mu_0}{\sigma}\right|$. From the curve we see that, when d is larger than 0.4, the probability of accepting the null hypothesis is practically zero. Since our significance test *did* reject the null hypothesis, we may reasonably assume that our $d=\left|\frac{\mu_1-\mu_0}{\sigma}\right|$ is larger than 0.4, and thus perhaps infer a bound for the true value of $|\mu_1-\mu_0|$, in other words, some "confidence interval" for μ_1.

On the other hand, suppose that only 10 items were tested and a significant result was obtained. If we look at the curve for $n=10$ in Fig. 2, we see that the value of d which is practically certain to be picked up on a significance test is now $d=1.5$ or larger. A significant result from an experiment which tested only 10 items thus, as expected, corresponds to a wider confidence interval for μ_1 than that inferred from the test of 100 items. A rough comparison of the relative widths may be made. More quantitative comparisons could be made, but the purpose here is to show a broad general relationship.

7. Relation to the Problem of Determining Sample Size.

The problem of finding the required sample size to detect differences between means can also be approached in two ways. We can specify tolerable risks of making either kind of "wrong" decision (errors of the first and second kind)—thereby fixing two points on the OC curve of the required test. Matching these two points with computed curves for various n enables one to pick the proper sample size for the experiment.

Alternatively, we can specify the magnitude of difference between means which is of importance. We then compute the sample size required to give a confidence interval of fixed length equal to the specified difference.

8. Conclusion.

Presentation of results in terms of confidence intervals is often more meaningful than is the presentation of the usual tests of significance (if the test result is not considered in connection with its OC curve). Things are

(Continued on back cover)

STATISTICS IN INDIA

by E. Douglass Burdick and **K. C. Seal**

University of Pennsylvania ***Planning Commission, Government of India***

This paper will be concerned primarily with the teaching of statistics in statistics departments of Indian Universities. For that to be meaningful, however, one must first get an idea of the general setting and status of statistics. This history of statistics in India is chiefly the history of Professor P. C. Mahalanobis, whose influence on the changing aspects of his country's life is probably unique among all statisticians. The Indian Statistical Institute, the National Sample Survey, the Central Statistical Organization, the Indian Journal of Statistics, Sankhya, and the approach used by the Central Planning Commission are tributes to his imagination and effective leadership. He has not had an easy time doing this. He has to fight hard; his ideas and influence as Statistical Advisor to the Cabinet are frequently subject to criticism. But without Professor Mahalanobis, the status of statistics and the shape of the Second and probably the Third Five Year Plans would have been (and will be) very different.

Enough is known already by readers of American Statistical journals about the Indian Statistical Institute to make detailed comment unnecessary. Among its approximate 1500 workers, there is a strong training and research center under the direction of Professor C. R. Rao, to which has been attracted as participants an honor roll of the world's statisticians. At this center and its outposts excellent training is available to Indians and other Asians in practically every recognized speciality. In addition, mention should be made of the Indian Council of Agricultural Research, Delhi; the Delhi School of Economics, the Gokhale Institute of Politics and Economics at Poona, Bombay State; the Indian Institute of Technology, Kharagpur, West Bengal; the All India Institute of Hygiene and Public Health, Calcutta, West Bengal; and the Demographic Institute, Bombay, where introductory and advanced studies in statistical methods and their applications may be undertaken in connection with one or more applied fields. Some of these organizations are supported by various agencies of the United Nations, the Rockefeller Foundation, or the Ford Foundation.

The Indian system of higher education follows closely the British, although changes are now being made. Normally eleven years of schooling are required for admission to a college of a University. The first two years at the college consist of studying for the "intermediate" in science or arts. The last two years are devoted to preparation for the B.A. or B.Sc. pass examination with an additional year for honors, unless one enters engineering, law, medicine or some other professional school, where the normal course may be as long as the maximum of five years for the M.B.B.S. (medicine) degree. Post-graduate training leads, as far as statistics is concerned, to the M.A., M.Sc., or Ph.D. degrees.

It would be fair to say that as of now the training in statistics for scientists, physicians, and engineers is very meagre in the universities of India. Most of the training is for people who aim to enter government service, including the teaching profession, or business. There is considerable activity in the fields of agricultural statistics, intelligence testing, demography, and family budget studies. In general, Indian training is stronger in mathematical statistics than in applied statistics; yet the activities of the graduates are likely to be concentrated in the applied field. As is frequently the case in the United States, most of the statistics taught is by people whose primary interest is in some other field, particularly psychology, education, economics, and commerce, where statistics of an elementary sort, usually with no laboratory practice, may be a required subject.

With this background, we now turn to the quantitative aspects of statistics training in specifically designated statistics departments. In "India 1958" issued by the Ministry of Information and Broadcasting, the following data are given on higher education as of 1957. There were 37 universities with a total of 1109 attached and affiliated colleges. Calcutta University was the largest with 136 colleges and over 100,000 students, nearly one-sixth of the total, in 1955-56. Enrollments are rising yearly. We are indebted to a report by Dr. P. B. Patnaik [1] of the Indian Statistical Institute on "Facilities for Training Research in India" for the following information as of 1955. Twenty universities contained a total of 27 statistics departments. The twenty universities were located in Delhi and ten of the fourteen States. States without statistics departments were Jammu and Kashmir (North), Madhya Pradesh (Central), Orissa (East) and Rajasthan (North). Nevertheless, each of the five regions of India contains at least one statistics department.

One may classify the offerings in a college as pass, honors, and post-graduate. Of the 27 colleges, 13 offer pass courses only. The teaching titles used. in descending order of rank, are professor, reader, lecturer and practical or lecture assistant. The 13 colleges offering pass courses only had a total of 4 professors (3 at Poona University colleges), 2 readers, 12 lecturers, and no lecture or practical assistants. In two, a reader was the highest ranking man, and in five, it was a lecturer. Three colleges, Presidency College, Calcutta; Cotton College, Gauhati (Assam); and Presidency College, Madras,

[1] Indeed Dr. Patnaik should be listed as a main author, once removed, of this document.

offer the Honors course as the highest and sometimes only one. These institutions had, in 1955, a total of 2 professors (none at Madras), 2 readers (Calcutta and Madras), 3 lecturers (one each), and 1 practical or lecture assistant (Calcutta). The remaining 12 institutions offered post gradaute work, sometimes with no pass or honors work, and their combined staff totalled 47, of whom 5 were professors, 11 were readers (one with the title of assistant professor) and 31 were practical or lecture assistants (4 were part-time). It may be noted that 7 colleges giving post-graduate work had no professor, one had a total staff of two in the department, and 8 out of the 12 had no lecture or practical assistant.

Dr. Patnaik reports other information that may be sampled in a non-random fashion for interest. Baroda and Poona reported Hollerith and Powers-Samas sorters, respectively, punchers and verifiers; and University College, Bombay, reported one punch and one verifier. All these institutions are in one State, Bombay. (The Indian Statistical Institute is well equipped, including two electronic computors and a research laboratory on computors). Several departments reported no calculating machine equipment. The pay scale of professors ranged from Rs. 350 (we believe this to be extraordinary low for India) to Rs. 1250 per month (Re. 1 = $0.21) with a median of about Rs. 800 for the 10 giving data. The per capita income for India is approximately Rs. 25 per month but most Indians are rural and illiterate. Probably Rs. 250 or more per month would be classified as upper income group. Salary scales for readers including assistant professors were reported ranging from Rs. 300 to Rs. 1000 per month with a median of Rs. 550. Data on lecturers give a range from Rs. 150 to Rs. 600 per month with a median of Rs. 400. For the practical assistants or demonstrators reported, the range was Rs. 100 to Rs. 300 per month with a median of Rs. 200. Ten colleges reported a total of 25 (range 1-6) research scholarships ranging in value from Rs. 50 to Rs. 100 per month but several were not awarded in 1955. All told in 1954, there were admitted 332 students to B.A. or B.Sc. pass courses, 45 to B.A. or B.Sc. Honors courses and 105 M.A. or M.Sc. degrees were awarded. Dr. Patnaik estimates that not more than 7 per year would receive the Ph.D. degree. With the sponsorship of the University Grants Commission and its financial support, it is believed that by now about 380 are admitted each year to pass courses, about 70 to B.Sc. Honors courses and about 200 to the Master's course.

In all, 13 colleges reported, as of 1955, 39 not necessarily different research interests. We will list these because they should give the best insight into reasonably current emphases in statistics in Indian Universities. Because we suppose that few readers know Indian geography well, we will give the state and region of the university.

1. Andhra University, Andhra Pradesh (South)—stochastic processes; time-series; multivariate analysis.
2. Baroda University, Bombay (West)—education statistics; regression problems.
3. Bombay University, Bombay (West)—mathematical statistics; combinatorial problems; econometrics; design of experiments.
4. Calcutta University. West Bengal (East)—sample surveys; educational tests; decision theory; non-parametric inference; topographical variation in statistical fields; estimation and tests.
5. Presidency College, Calcutta University, West Bengal (East)—estimation; spatial distributions.
6. Lucknow University, Uttar Pradesh (Central)—stochastic processes; inference; analysis of time-series.
7. Madras University, Madras (South)—stochastic processes; studies of distributions; non-parametric tests.
8. Presidency College, Madras University, Madras (South)—design of experiments; distribution functions.
9. Mysore University, Mysore (West)—industrial statistics.
10. Nagpur University, Bombay (West)—design of experiments.
11. Patna University, Bihar (East)—mathematical statistics (tests of hypothesis, etc.)
12. Poona University, Bombay (West)—theory of probability; estimation and tests; sample surveys; distribution theory.
13. Travancore University, Kerala (South)—sample surveys; population studies; non-parameteric tests; distribution; family budget studies; multivariate analysis.

We have the syllabus for pass, honors and master's courses at Calcutta University as well as examination questions for a recent year. In general, Calcutta University would be considered as one of the strongest in India in statistics. The student's standing is determined entirely by his grade on the final examination for bachelor pass or honors and for the master's degrees. The Ph.D. requires a master's degree followed by a thesis, which must be defended. The bachelor pass courses have three compulsory papers; two theoretical and one practical on the material covered by the two theoretical papers. The first paper covers descriptive and applied statistics including the simpler Pearsonian Type Curves such as I, II, III and VII, multiple and partial correlation, index numbers and time series. This paper also includes sample surveys, quality control, and vital statistics rates and the life table. The second theoretical paper covers probability, interpolation, sampling theory, and design of experiments.

The bachelors honors examination has six compulsory papers; four theoretical and two practical. In addition to the material covered in the pass course, one finds such items as Gram-Charlier's Type A series, intra-class correlation, incomplete beta and gamma integrals, considerably added emphasis to numerical mathematics (e.g.,

Euler-Maclaurin expansion, numerical differentiation and integration). Estimation theory is emphasized. One paper is devoted to official statistics, economic statistics, vital statistics, education and psychological statistics and statistical quality control. The coverage on the master's papers is similar to the bachelor's honors papers; but more depth is required.

Because of the concentration on examinations, a sample of the questions on the examinations will give an idea of the content covered but no necessary idea on the quality required. Nevertheless it is known that at least some Indian students have found themselves very well prepared in statistics when they have done advanced work in the United States. In addition Professors R. C. Bose and S. N. Roy have been attracted from Calcutta University to the University of North Carolina. We took at random three out of nine questions on the 1957 Third Bachelor Honors paper.

"Question 5. Explain clearly the model used in analyzing the data of randomized block design experiment. Derive the analysis of variance table for such a design. What modification in the model and analysis will be necessary to test the hypothesis of equality of treatment effects in such a design if a concomitant variate is present?

"Question 8. Write a critical note on the role of randomization, replication and local control in the design of field experiments with suitable examples. Discuss the relative advantages and disadvantages of Latin Square and Randomized Block designs.

"Question 4. Compare the methods of random and purposive sampling discussing critically their relative advantages and disadvantages. How far can the method of stratified sampling be said to combine the advantages of both? Derive Neyman's formula for the allocation of sample units to be chosen from different strata of a population. Can you suggest any population for which proportionate stratified sampling is the optimum?"

To what can these students look forward? Of the Master's graduates in India, the evidence in 1955 seemed to be that about 30% were teaching statistics or mathematics or were in research work, 25% were in government, 10% in business, 20% were in non-satistical jobs, and 15% were unemployed. We have given previously the salaries to be expected in teaching; but it should be added that no matter how good a man is, he cannot be promoted unless a post is vacant at that same institution or elsewhere. The retirement age is now in the process of being raised from 55 to 60. Lack of promotion possibilities therefore lead to frequent frustrations, and then one tries to seek work with the United Nations, or some foreign or international organization which pays better and has prestige value. Efforts are being made to raise faculty salaries, and they are no doubt generally somewhat higher today than in 1955. There are many posts in the Central and State governments, and the Central Government usually pays the highest salaries outside of business, about which we know little except that it seems to have a competitive advantage. The following brief table summarizes information from the "Statistical System in India" published in 1957 by the Central Statistical Organization:

Statistical Personnel and Budgets in India Central and State Governments, 1957

Type of Government	Technical Staff		Ministerial Staff		Total	Budget in Rs. 1000
	Gazetted	Non-Gazetted	Gazetted	Non-Gazetted		
Central	236	2,268	25	3,259	5,788	16,825
State	341	2,962	5	1,125	4,433	9,390
Total	577	5,230	30	4,384	10,221	26,215

To give an idea of the Central Government pay scale, we will list the titles and pay ranges for one large ministry. It usually takes years to get from the low to the high, and frequently a merit requirement must be attained at about the middle of the range. To rise in grade, usually one has to win in a competitive examination. There are additional cost of living benefits, which amount to as much as 50% of the low salaries and 10% of the higher ones. In addition, the Central Government tries to provide free medical benefits and housing for 10% of salary:

Title	*Base salary in Rupees per Month*
(a) *Gazetted:*	
Director	1,100—1,800
Dy. Director	800—1,150
Asst. Director	600—1,000
Research Officer	350— 850
(b) *Non-gazetted:*	
Investigator—Grade I	275— 500
Jr. Investigator	160— 330
Draftsman	150— 275
Sr. Computor	80— 220
Hollerith Punch Operator	55— 130
Computor	55— 130

A NOTE ON "CHARACTERISTICS OF THE MEMBERSHIP OF THE AMERICAN STATISTICAL ASSOCIATION, 1958"

by A. J. JAFFE
Bureau of Applied Social Research
Columbia University

A very interesting article by Rothman and Bisgyer [1] throws much light on the nature of our membership. In particular it highlights the very heterogeneous nature and diverse interests of the membership and shows why it is so difficult to define a "statistician." "Statisticians" apparently are found wherever we find persons with A.B. or higher degress; there is no occupation, industry or field of professional interest in which at least a few statisticians do not appear.

This observation leads me, via a matrix of interrelated paths, to question the rather complacent conclusion that adequate numbers of younger people are joining the Association. The authors simply raise the question as to "whether younger people are joining the Association" (p. 33). Obviously, any number of members under the age of, say 25, permit us to say that younger people are joining. The authors evidently meant to ask, "Is the Association getting its fair share of the younger people who are entering statistics as an occupation, or is the Association becoming top heavy with the older—mature—statisticians?" It is to this question that I wish to address my remarks.

Let me state at the onset that I feel that the Association is not getting its fair share of the younger workers in the field of statistics, whatever that field may be, and that a more active recruitment program is needed. This belief is based on the following set of statistics.

The age distribution of the ASA membership in 1958 is given in this article as follows:

20 to 29 years	22%
30 to 44 years	47%
45 to 59 years	26%
60 and over	5%
Total	100%

By comparing this age distribution with that of the population, total or male white, the authors arrive at their complacent conclusion.

However, the authors have already told us that practically all ASA members have at least an A.B. degree. Hence, let us compare the age distribution of the membership with that of the population which has at least four years of college. We then have the following comparison:

Age	ASA Members 1958	Col. grads. 1957[a] Total	Male
20 to 29 years	22%	21%	21%
30 to 44 years	47	40	43
45 to 59 years	26	26	24
60 and over	5	13	12
Total	100%	100%	100%

[a] U.S. Bureau of the Census, *Population Characteristics*, "Educational Attainment," P-20, No. 77, table 1.

If information were available on the sex composition of the ASA membership, we could, of course, weight the figures for males and females in the total college educated population in order to arrive at a distribution more nearly comparable to that of ASA membership.

This comparison can be viewed as suggesting that the ASA is getting its fair share of the younger professionals. However, it also raises the question as to why we are so over-represented in the age group 30 to 44 years, and under-represented in the age group 60 and over.

We submit that the answer lies in the fact that the universe of college graduates is only an approximation to the universe of possible ASA members. For the latter no data are available since we have no good definition of a "statistician." Nevertheless, we are inclined to believe that the universe of statisticians has been growing much more rapidly then has the college educated population, and therefore, contains a larger proportion of younger people than does the total college educated population.

An index of the universe from which statisticians are derived can be obtained by adding the numbers of persons engaged in the following professions: college presidents, professors, and instructors; designers; all engineers; and the census misc. group of dieticians and nutritionists, foresters and conservationists, natural scientists, personnel and labor relations workers, social scientists, and prof. NEC. The numbers of persons in these occupations as percentages of all persons in professional occupations are as follows: [a]

Year	Total	Male
1950	20%	29%
1940	14	22
1930	11	18

[a] Data for 1950 and 1940 from 1950 U.S. Census of Population, P-C 1, p. 267. Data for 1930 from 1930 U.S. Census of Population, Vol. V.

(Continued on page 31)

[1] Abe Rothman and Edgar M. Bisgyer, "Characteristics of the Membership of the American Statistical Association, 1958," *The American Statistician* (October, 1959).

QUESTIONS AND ANSWERS

Edited by ERNEST RUBIN
U. S. Department of Commerce and American University

The Quantitative Data and Methods of the Rev. T. R. Malthus

In the discussion of the *Wealth of Nations* I explained briefly how Adam Smith used quantitative information and statistical concepts.[1] Malthus, who was Smith's immediate successor in the development of economic theory in England, elaborated most of Smith's views but shifted the emphasis in economic thinking to the problem of population. In his appreciation and understanding of population growth and its implications for economics Malthus had deeper recourse to quantitative considerations than any of his predecessors or contemporaries.

It does not seem really necessary or particularly useful to label Malthus as a statistical economist, econometrician, or demographer. By way of background it may be noted that Malthus was graduated from Cambridge in 1788 as Nineth Wrangler, indicative of his mathematical ability, and that he helped found the Royal Statistical Society in 1834. From a methodological viewpoint he was an important expositor and outstanding exponent of quantitative investigation in the social sciences. It is the purpose of this discussion to call attention to Malthus' use of statistics and mathematics in his famous "Essay on Population."[2]

In his first chapter Malthus stated:

". . . population, when unchecked, goes on doubling itself every twenty-five years or increases in a geometrical ratio."[3]

". . . considering the present average state of the earth, the means of subsistence, under circumstances the most favourable to human industry, could not possibly be made to increase faster than in an arithmetical ratio."[4]

A basis for a geometric rate of population growth came from a variety of sources, principally Benjamin Franklin and the population experience of the U.S. between 1790 and 1820,[5] Sir William Petty, and calculations made by the Swiss mathematician, Leonard Euler. The second statement quoted was based on Malthus' observations of farming and food production primarily in England and on the continent. Malthus' statements are in the nature of statistical projections or estimates of growth rates of population and substance.

It is of interest to note how the foregoing considerations led Malthus to reason in terms of a macro model and to comment on an aspect of the aggregation problem. Early in his work he makes a remark that indicates he is thinking primarily in terms of the entire world population, stating explicitly:

"Taking the whole earth, instead of this island, emigration would of course be excluded . . ."[6]

With regard to an aspect of the aggregation problem that arises when we consider macro dimensions he observes:

". . . If our attention were confined to one parish, and there were no power of emigrating from it, the most careless observer could not fail to remark that, if all married at twenty, it would be perfectly impossible for the farmers, however carefully they might improve their land, to find employment and food for those who grow up; but when a great number of these parishes are added together in a popular kingdom, the largeness of the subject, and the power of moving from place to place, obscure and confuse our view. We lose sight of a truth, which before appeared completely obvious; and in a most unaccountable manner, attribute to the aggregate quantity of land a power of supporting people beyond comparison than the sum of all its parts."[7]

In examining the quantitative methods of Malthus it is necessary to refer to his use of mathematical as well as statistical techniques. With regard to mathematics we have cited the well known references to the geometric and arithmetic progressions. Malthus also used a general formula for estimating future population (a variation of the compound interest formula),[8] thus:

---

[1] "Statistics and Adam Smith," *The American Statistician*, April 1959.

[2] The title of my discussion is pretentious because I do not refer to other works on economics by Malthus. It should not be inferred that Malthus employed the quantitative approach only in his "essay on population." A cursory examination of his works reveals that Malthus employed statistical data and ideas in many of his writings.

The first edition of the "Essay" was published in 1798 and subsequently expanded and revised by Malthus over a period of twenty-eight years. The last edition prepared by Malthus, the sixth, appeared in 1826 and contains a preface by him dated January 2, 1826. All references in this paper are to *An Essay on the Principle of Population* by the Rev. T. R. Malthus (reprinted from the last Edition Revised by the Author), (Ward, Lock, and Co., Ltd., London, 1890), pp. 614 plus xlii.

[3] Ibid., p. 4.

[4] Ibid., p. 6.

[5] The population of the U.S. (in thousands) was 3,929 in 1790; 5,308 in 1800; 7,240 in 1810; and 9,638 in 1820. *Historical Statistics of the United States: 1789-1945*, (U.S.G.P.O., 1949), p. 25. According to these data the U.S. population doubled in about 23.5 years. Malthus did not take into account the effects on population of net immigration, slave importations, and population additions resulting from territorial acquisitions (Louisiana Purchase, 1803 and Florida, 1819). He believed that U.S. population growth was due almost entirely to high fertility. This view is not quite accurate; not much data, however, were available to Malthus on U.S. immigration prior to 1820 and on the population in the territories which the U.S. acquired.

[6] Malthus, ibid., p. 7, p. 41.

[7] Ibid., p. 151.

[8] Ibid., p. 238. This formula may also be written:

$$A = P\left(1 + \frac{m-b}{mb}\right)^n$$

". . . Log. $A = \log. P + n \log. \left(1+\frac{m-b}{mb}\right)$

A representing the required population at the end of any number of years; n the number of years; P the actual population at the given period; $\frac{1}{m}$ the proportion of yearly deaths to the population, or the ratio of mortality; $\frac{1}{b}$ the proportion of yearly births to the population, or ratio of births." [8]

Malthus occasionally resorts to mathematical formulation or terminology to express certain ideas. He writes, for example, that ". . . The passion between the sexes has appeared in every age to be so nearly the same, that it may always be considered, in algebraic language, as a given quantity." [9] He comments on cattle breeding apropos Condorcet's theory of the organic perfectibility of plants and animals, utilizing some of the concepts he had studied in mathematics, particularly calculus and series:

> ". . . it is a maxim among some of the improvers of cattle, that you may breed to any degree of nicety you please; and they found this maxim upon another, which is, that some of the offspring will possess the desirable qualities of the parents in a greater degree. In the famous Leicestershire breed of sheep, the object is to procure them with small heads and small legs. Proceeding upon these breeding maxims, it is evident that we might go on, till the heads and legs were evanescent quantities; but this is so palpable an absurdity, that we may be quite sure the premises are not just, and that there really is a limit, though we cannot see it, or say exactly where it is. In this case, the point of the greatest degree of improvement, or the smallest size of the head and legs, may be said to be undefined; but this is very different from unlimited, or from indefinite, in M. Condorcet's acceptation of the term. Though I may not be able in the present instance to mark the limit, at which further improvement will stop, I can very easily mention a point, at which it will not arrive. I should not scruple to assert, that were the breeding to continue for ever, the heads and legs of these sheep would never be so small as the head and legs of a rat." [10]

On several occasions Malthus turned to applied mathematics, particularly life tables, and certain related concepts of vital statistics namely, ". . . the probability of life, or the age to which half of the born live, . . . and the mean life . . ." [11] He cited Euler, reproduced a number of his tables,[12] and was familiar with the tables and acturial results of Barton,[13] Bridge,[14] Sussmilch,[15] Milne [16] and others. Malthus' appreciation and interpretation of the life tables in developing parts of his general argument are especially significant if we consider that life tables were scarcely a century old at the time he wrote.

To round out this discussion of Malthus' grasp and application of quantitative methods we call attention to some of his statistical insights. With regard to regular repetitions of a socio-biological character he observes that:

". . . the population of Sweden is in a peculiar manner affected by every variation of the seasons; . . . the registers of Sweden show that the births, marriages and deaths increase according to the state of the harvests," and cites the following data of Wargentin, a Swedish statistician, to document these points.

		Marriages	Births	Deaths
Barren years	1757	18,799	81,878	68,054
	1758	19,584	83,299	74,370
Abundant years	1759	23,210	85,579	62,662
	1760	23,383	90,635	60,083

Malthus was quite familiar with the concepts of seasonality and of correlation. He did not, however, restrict his ideas of systematic reoccurrences to the seasons but clearly recognized periodicities of considerably broader time spans. Thus he notes that:

> "Epidemics return more or less frequently, according to their various soils, situations, air, etc. Hence some return yearly, as in Egypt and Constantinople; others once in four or five years, as about in Tripoli and Aleppo; others scarce once in ten, twelve or thirteen years, as in England, others not in less than twenty years as in Norway and the Northern Islands." [18]

One of the problems that interested Malthus was the measurement of the fecundity of marriages. In this connection he criticized a Swiss writer, Muret, for incorrect inferences even though Muret appears to have collected valuable data. Malthus comments:

> ". . . (Muret) found that 375 mothers had yielded 2,093 children, all born alive; from which it followed that each mother had produced 5 10/12, or nearly six children. These, however, were all actually mothers, which every wife is not; but allowing for the usual proportion of barren wives at Vevay, which he found to be 20 out of 478, it will still appear that the married women . . . produced about 5 1/3 children. (On account of second and third marriages, the fecundity of marriages must always be less than the fecundity of married women. The mothers alone are here considered, without reference to the number of husbands.)" [19]

Although Malthus was generally concerned with broad demographic problems and their interrelationship with economics, he analyzed in considerable detail those subjects that today constitute the subject matter of vital statistics. His comments frequently deal with the limitations and the reliability of the data of births and deaths; and Malthus points out how certain qualitative

[9] Ibid., p. 293.
[10] Ibid., p. 303.
[11] Ibid., p. 187.
[12] Ibid., pp. 274-275.
[13] Ibid., p. 267, "In the transactions of the Society at Philadelphia (vol. iii No. vii, p. 25), there is a paper by Mr. Barton, entitled "Observations on the Probability of Life in the United States . . ." (date is not given).
[14] Ibid., p. 273 and p. 276.
[15] Ibid., p. 277.
[16] Ibid., p. 268, footnote. Mr. Milne is identified as actuary to the Sun Life Assurance Society.
[17] Ibid., pp. 154-155.
[18] Ibid., p. 66.
[19] Ibid., p. 192.

factors that make up components of data, influence or complicate the problems of measuring vital phenomena.

It will be recalled that when Malthus wrote the principal primary sources of vital statistics were registers or lists, national censuses having come only into limited use during the Eighteenth Century. Many of Malthus' critical observations, therefore, relate to registers, although he also called attention to defects of census enumeration. Let us first cite a few examples of his awareness of and sensitivity to data problems. Malthus notes that:

> "The registers of the city of Petersburg are supposed to be such as can be entirely depended upon; and these tend to prove the general salubrity of the climate. But there is one fact recorded in them, which is directly contrary to what has been observed in all other countries. This is a much greater mortality of female children than male. (Malthus then cites the relevant statistics and proceeds) . . . this is very extraordinary, as it has been generally remarked, that in every stage of life, except during the period of child-bearing the mortality among females is less than among males . . ." [20]

The foregoing questions the accuracy of data by use of the comparative method.

Malthus also resorted to direct action when he was not satisfied with data. Commenting on the high infant mortality at a foundling home in Petersburg Malthus states:

> ". . . No regular lists are published, and verbal communications are always liable to some uncertainty. I cannot therefore rely upon the information which I collected on the subject; but from the most careful inquiries which I could make of the attendants at the house in Petersburg, I understood that 100 a month was the common average." [21]

Two more references to registers may be briefly quoted. Malthus observes ". . . there is reason to believe that in all registers the omissions in the births and deaths are more numerous than in the marriages." [22] and "The apparent increase of (Russian) mortality is to be attributed rather to the former inaccuracy of the registers, than to increased unhealthiness. It is now (1825) allowed that the registers before 1796 were very imperfectly kept." [23] With regard to various aspects of data problems in broader enumerations and censuses, Malthus offers some interesting and varied statistical comments:

> ". . . There must always be some uncertainty respecting the proportions of the persons employed in the army, navy and merchant service, properly belonging to the resident population, and as the male population is on other accounts more frequently on the move than the female, it has been judiciously proposed to estimate the rate of increase by the female population alone . . ." [24]
>
> ". . . In the year XI (1803, France) . . . an inquiry was instituted . . . for the express purpose of ascertaining the average proportion of births to the population; and such an inquiry, so soon after the returns of the year IX (1801), affords a clear proof that these returns were not considered by the minister as correct. In order to accomplish the object in view, choice was made of those communes in 30 departments distributed over the whole surface of France, which were likely to afford the most accurate returns . . ." [25]
>
> ". . . In the year 1763 an enumeration of the (Russion) people, estimated by the poll-tax, gave a population 14,726,696; and the same kind of enumeration in 1783 gave a population of 25,677,000, which if correct, shows a very extraordinary increase; but it is supposed that the enumeration in 1783 was more correct and complete than the one in 1763 . . ." [26]

Malthus was quite cautious in drawing inferences from certain types of estimates as distinct from enumerations:

> ". . . In the town of Halle, in the year 1700, the number of annual marriages was to the whole population as 1 to 77. During the course of the 55 following years, this proportion changed gradually, according to Sussmilch's calculation, to 1 in 167. This is a most extraordinary difference, and, if the calculation were quite accurate, would prove to what a degree the check to marriage had operated, and how completely it had measured itself to the means of subsistence. As however the number of people is estimated by calculation and not taken from enumerations, this very great difference in the proportions may not be perfectly correct, or may be occasioned in part by other causes . . ." [27]

The foregoing passage includes concepts of time series and correlation, as well as the technique of comparing two proportions. Malthus employed this latter method efficaciously:

> ". . . Sussmilch has calculated the mean proportion of annual marriages compared with the number of inhabitants as between 1 in 107 and 1 in 113 . . . Crome, a later statistical writer, taking a mean between 1 in 92 and 1 in 122, estimates the average proportion of marriages to inhabitants as 1 to 108. But in the registers of 22 Dutch villages . . . it appears that out of 64 persons there is 1 annual marriage. This is a most extraordinary deviation from the mean proportion . . ." [28]

This language seems to stop just short of our present day tests for the difference between two proportions.

Malthus' study of the vital statistics of the countries of Europe was motivated, in part, by the desire to ascertain more accurately the nature of population growth. In this connection the following statement of Malthus, which opens the chapter "On the Fruitfulness of Marriages" seems to me particularly significant:

> "It would be extremely desirable to be able to deduce from the registers of births, deaths and marriages in different countries, and the actual population with the rate of increase, the real prolificness of marriages, and the true proportion of the born which lives to marry. Perhaps the problem may not be capable of an accurate solution; but we shall make some

[20] Ibid., pp. 167-168.
[21] Ibid., p. 168.
[22] Ibid., p. 263 ftn. 2.
[23] Ibid., p. 176.
[24] Ibid., pp. 244-245.
[25] Ibid., p. 212.
[26] Ibid., p. 173.
[27] Ibid., p. 179.
[28] Ibid., p. 177.

approximation towards it, and be able to account for some of the difficulties which appear in many registers . . ." [29]

The treatment of this problem by Malthus is very instructive and suggestive, and should be of considerable interest to students of statistics and of special value to vital statisticians.

At the beginning of this discussion I said that Malthus thought in macro or global terms. This viewpoint did not obscure for him certain methodological limitations, to cite one of particular statistical interest:

"Statistical writers have endeavoured to obtain a general measure for all countries taken together; but, if such a measure could be obtained, I do not see what good purpose it could answer . . . When the mortality of the human race in different countries and different situations varies so much . . . no general average could be used with safety in a particular case . . ." [30]

I have attempted in this brief analysis to outline the quantitative methods employed by Malthus as well as his treatment of statistical data. Malthus utilized a wider range of sources than Adam Smith, not only in the temporal and spatial senses, but also with regard to subject-matter. As evidenced by his travels in various European countries, Malthus combined erudition with on the spot investigations of data and sources.

He believed in and sought to apply scientific method to what is now designated as the social sciences. For reasons that go beyond the scope of this paper, Malthus was misinterpreted and maligned, particularly by those who did not read him at all or who before reading him were completely prejudiced against the propositions Malthus sought to establish. I hope this short discussion has been a constructive step in redressing a view of Malthus that stems essentially from ignorance or irrationality.

[29] Ibid., p. 260.
[30] Ibid., p. 30.

A NOTE ON "CHARACTERISTICS . . ." —CONTINUED FROM PAGE 27

Even if the reader wishes to discount the 1930 figure as being noncomparable a trend remains—one clearly indicating that the universe of potential ASA members is growing more rapidly than is the college educated population. The changing occupational structure is resulting in an increasingly larger number and proportion of persons engaged in occupations (and presumably having interests) which would make them candidates for ASA membership. This changing occupational structure should result in there being many more younger people in the universe of statisticians.

If we had trouble measuring trends in the size of the universe of statisticians, we have even more trouble in ascertaining the age composition of this universe as of 1950. The 1950 census provides age data for the following occupations (the totality of which may be taken as an index to the age composition of statisticians): college presidents, professors, and instructors; all engineers; natural scientists; social scientists. The age composition of the ASA membership (in 1958) compares with the age distribution of employed men in these selected occupations (in 1950) as follows:

Age	ASA Members 1958	Men in selected occupations, 1950
20 to 29 years	22%	24%
30 to 44 years	47	44
45 to 59 years	26	25
60 and over	5	7
Total	100%	100%

Since 1950 it is our belief that the age composition has become a little younger because of the very large increase in the numbers of engineers and other persons who presumably use, more or less, statistics. These post 1950 additions, for the most part, are recent college graduates and therefore younger.

Let us recruit more of them.

ELECTION OF NEW FELLOWS

At the Annual Meeting of the Association held in Washington, D.C., the Committee on Fellows, composed of Martin R. Gainsbrugh, Chairman, Chester I. Bliss, Churchill Eisenhart, Dudley Kirk, and Frederick Mosteler, announced the election of the following new Fellows:

Kenneth J. Arrow, Professor of Economics and Statistics, Stanford University, for his path-breaking work on social choice and individual values and for his contributions to the theory of sequential decision problems, inventory policy and the development of mathematical models appropriate for economics.

Jules Backman, Professor of Economics at New York University, for his prolific contributions toward the improvement and enrichment of the existing body of price and wage statistics and their productive application to the economic problems of the steel, railroad, and other key industries.

Ralph E. Burgess, Chief Economist, American Cyanamid Company, for his development of statistics dealing with business forecasting and industrial research, for his skilled leadership as General Program Chairman of the 1958 Annual Meeting, and for his work in increasing the Association's institutional membership.

Ansley J. Coale, Director, Office of Population Research and Professor of Economics, Princeton University, for important contributions to the methodology of population projections, for his innovations in determining the effects of changes in mortality and fertility on age composition, for his theoretical studies on the concept of stable age distribution, for his studies of population growth and economic development in low-income countries.

William S. Connor, Jr., Senior Statistician, Research Triangle Institute (and formerly, National Bureau of Standards), for his original and important contributions to the theory of the construction and analysis of incomplete-block and fractional-factorial designs, for leadership in the practical application of such designs in the physical sciences, and for noteworthy accomplishments as the first chairman of the Association's special Committee on Publications Policy.

Clyde H. Coombs, Professor of Psychology, University of Michigan, for his research and teaching in the fields of quantitative psychology and psychometrics including his original theoretical and empirical work on factor analysis, preference, and scaling methods.

Bernard G. Greenberg, Professor of Biostatistics in the School of Public Health, University of North Carolina, for his untiring support of sound statistical procedures, both in the fields of public health and medicine and in the training of statisticians, for his many methodological contributions to quantitative biological research and to the development of order statistics.

Hugo C. Hamaker, Chief Statistician, Philips Research Laboratories, Eindhoven, Netherlands, for leadership in the application of statistical methods in industry and technology, for his many lucid publications on sampling inspection theory and practice, and on the use of statistical principles and techniques in industrial operations.

Earl E. Houseman, Director, Statistical Standards Division, Agricultural Marketing Service, United States Department of Agriculture, for his pioneering work in the development of sampling methods for agricultural surveys, for advancement and maintenance of statistical standards in the Department of Agriculture, for excellent statistical consulting service on a wide variety of experimental, survey and analytical problems over a period of many years.

Leslie Kish, Professor of Sociology and Head of Sampling Section, Survey Research Center, University of Michigan, for his contributions to survey sampling methodology and evaluation of response error, for his frontier research in the statistical analysis of differentiation in population distribution and characteristics.

Morton Kramer, Chief, Biometrics Branch, National Institute of Mental Health, for his pioneering activities in the development of uniform statistical reports on the mentally ill from the hospitals and clinics of the nation, and for his contributions to the understanding of the dynamics of schizophrenia through his studies on the incidence and prevalence of the disease.

Gerald J. Lieberman, Professor of Statistics and Industrial Engineering, Stanford University, for his noteworthy contributions to the advancement of statistical methodology in industrial engineering and other fields through teaching and distinguished authorship, and for important contributions to the theory and practice of sampling inspection through original research and able direction of a major program in this field.

Dennis V. Lindley, University Lecturer in Mathematics and Director of the Statistical Laboratory, Cambridge University, for his penetrating analyses of the theory of statistical inference, for important contributions to and lucid exposition of the statistical theory of regression and functional relationships, and for his able direction of a major research center in statistics.

John Mandel, Organic and Fibrous Materials Division, National Bureau of Standards, for his noteworthy achievements in the application of statistical methods in the development and evaluation of materials specifications and methods of test, and for his many publications in applied statistics that have contributed greatly to the acceptance of modern statistical methods in the physical sciences and engineering.

Philip J. McCarthy, Professor of Applied Statistics, Cornell University, for his contributions in the application of statistics to the social sciences, for his research in sampling methods, for his rigorous advancement of statistical innovations both as an officer of the Association and as its representative in the Social Science Research Council.

Paul Meier, Associate Professor of Statistics, University of Chicago, for his original contributions on a number of important biometrical and statistical problems, for outstanding effectiveness as a consultant on statistical methodology to research workers in medicine and public health, and for his many efforts directed toward improvement of the planning, conduct and interpretation of clinical and field studies in these areas.

Guy H. Orcutt, Professor of Economics, University of Wisconsin, for his major contributions to the study of time series analysis, particularly with reference to problems of autocorrelation, for his application of statistics to micro-economics, especially through frontier use of advanced computers in multivariate analysis.

Daniel O. Price, Director, Institute for Research in Social Science and Professor of Sociology, University of North Carolina, for his contributions to statistical methods in demography and the social sciences including factor analysis in the study of metropolitan centers, checks on census underenumeration and innovations in the statistical analysis of migration.

Roy Reierson, Vice President and Economist, Bankers Trust Company, for his pioneering work in developing both the conceptual framework and the statistical data dealing with sources and uses of investment funds, and for his valued activities in the affairs of the Business and Economic Statistics Section.

Irving H. Siegel, Economist at the President's Council of Economic Advisers, for his ground-breaking work in the preparation of productivity indexes, his many perceptive articles clarifying problems of concept in index formulas and productivity measurements and for his stimulating explorations of the conditions and implications of technological progress.

Charles D. Stewart, Deputy Assistant Secretary of Labor for Standards and Statistics, for his substantial contribution to the statistical measurement and analysis of labor force, employment and unemployment, his contributions to the literature of labor economics, his efforts to improve Federal economic statistics, and for his effective leadership as General Program Chairman of the 1959 Annual Meeting.

NEWS ABOUT MEMBERS

William I. Abraham has been appointed Adjunct Professor of Economics at New York University. Dr. Abraham will continue in his position with the United Nations Statistical Office.

John H. Bailey has accepted a position as Associate Statistician in Reliability Technology with the IBM Corporation, Poughkeepsie, New York.

George E. P. Box has accepted an appointment as Professor of Statistics at the Mathematics Research Center, University of Wisconsin, where he will be until next summer. During this time he will be assisting in planning a new Department of Statistics which will be set up in the University of Wisconsin in the fall semester, 1960.

William H. Chartener, formerly with the Department of Economics of the McGraw-Hill Publishing Company, has joined the senior staff of Stanford Research Institute in Menlo Park, California. He is serving as an economist and program manager in the Long Range Planning Reports Service.

Victor Chew is leaving his position as Assistant Statistician in the Institute of Statistics, North Carolina State College, to work as Mathematical Statistician, U. S. Naval Weapons Laboratory, Dahlgren, Virginia.

Jack N. Ciaccio has transferred from the Office of Statistical Standards, Bureau of the Budget, to the Education Statistics Branch, Office of Education, as an economist.

Ira H. Cisin, formerly adviser on research design at the Human Resources Research Office of the George Washington University, has been appointed project director of an epidemiologic study of alcoholic beverage usage patterns, in the California Department of Public Health, Berkeley.

John P. Comer, Jr. is temporarily in New York City studying mathematical statistics at Columbia.

William Copulsky has been transferred to the position of Assistant to the President and Economist, Cryovac Division, W. R. Grace & Co., Cambridge, Massachusetts. He was formerly Director of Business Development, Chemical Group, W. R. Grace & Co., New York City. In his new position he will report and advise on commercial and economic developments affecting the Division's business.

Constance E. Cox is taking a position as a Lecturer in Statistics in a new academy which has been established in Djakarta, Indonesia, to train statisticians and economists for government service. Her services are being loaned to the Colombo Plan by the Food and Drug Directorate of the Canadian Department of National Health and Welfare where she heads the Biometrics Section.

Marie M. Delaney, formerly Chief, Employee Statistics Section at the Bureau of Old-Age and Survivors Insurance, has been appointed Assistant Chief, Statistics Branch, in the Division of Program Analysis. Miss Delaney is also a visiting lecturer in Statistics at the University of Baltimore.

Paul M. Densen has been appointed Deputy Commissioner of the New York City Department of Health. Dr. Densen was formerly Director of the Division of Research and Statistics of the Health Insurance Plan of Greater New York. As Deputy, he will be in charge of planning and research for the Department.

Earl L. Diamond has joined the faculty of the Johns Hopkins University School of Hygiene and Public Health as Assistant Professor of Public Health Administration (Chronic Diseases) and of Biostatistics. He formerly was with the Department of Biostatistics of the University of North Carolina School of Public Health.

Stuart Garfinkle, formerly with the Bureau of Labor Statistics, has been appointed Chief of the Economic Statistics Branch in the Population Division, Bureau of the Census.

Leon S. Geoffrey, formerly with the Office of the Secretary, Department of Commerce, has been appointed Public Administration Advisor (statistics) at Taipei, Taiwan (Formosa) by the International Cooperation Administration. His address will be ICA Mutual Security Mission to China, APO 63, San Francisco, California.

Maurice I. Gershenson, Chief of the Division of Labor Statistics and Research, California Department of Industrial Relations, has been appointed chairman of the Subcommittee on Uniform Industrial Development Reporting of the State Chamber of Commerce Industrial Development Committee. The subcommittee is charged with the responsibility of developing a uniform procedure for the reporting of industrial development in California. This will involve preparation of standard definitions, classifications, units of measure, timing, geographic areas and report forms.

L. M. Giessinger is working as a Research Engineer in the Digital Computing Laboratory, Convair, San Diego.

Ramanathan Gnanadesikan, formerly Senior Statistician, Procter & Gamble Co., Cincinnati, is now a Member of the Technical Staff of the Mathematical Research Department, Bell Telephone Laboratories, Murray Hill, New Jersey.

Harold Goldstein, who has been Acting Chief, has been named Chief of the Division of Manpower and Employment Statistics, Bureau of Labor Statistics.

Anthony S. Gregorio is now a product engineer for the Sperry Rand Corporation, Semiconductor Division, in South Norwalk, Connecticut, working on silicon alloy diodes.

Stephen Harrison is now Director of the Analysis Division of Project Omega, operated for the Air Force by Technical Operations Inc., of Washington, D. C.

Manuel Helzner, formerly Associate Economist with the National Planning Association, has joined the Division of Postal Rates, Post Office Department, as Senior Economist.

Fay M. Hemphill, formerly Professor of Public Health Statistics, School of Public Health, University of Michigan, has been at the National Institutes of Health in Bethesda, Maryland, since September 1959. He is Chief of the Statistical Design and Analysis Section of the Division of Research Grants. His section will be responsible for designing the guidelines needed in the development of statistical projects within the Statistics and Analysis Branch.

Herman Hess has resigned from the staff of the Census Bureau to join the Technical Staff of the Thompson Ramo Woolridge Corporation.

Joseph R. Hochstim has left his position as Adviser on Research Design for the Human Resources Research Office, George Washington University, to become Principal Consultant to the Human Population Laboratory, California Department of Public Health, Berkeley, California.

Esther S. Hochstim has left the Department of Agriculture for Berkeley, California.

J. Edward Jackson is now back in the employ of the Eastman Kodak Company after having completed the requirements for the Ph.D. degree at Virginia Polytechnic Institute.

Sidney A. Jaffe has been designated as Acting Chief of the Division of Prices and Cost of Living, Bureau of Labor Statistics.

Emil H. Jebe, formerly with the Statistical Laboratory, Iowa State University, is now Research Mathematician, Operations Research Department, Willow Run Laboratories, University of Michigan, Ann Arbor, Michigan.

Jack Kleinot is now responsible for the sampling operations pertaining to the Evaluation Program of the 1960 Census of Population and Housing under the Statistical Methods Office.

H. P. Kuang received his Ph.D. from the University of Minnesota in July, 1959. He is currently Professor of Mathematics and Statistics at North Carolina State A. and T. College in Greensboro, North Carolina.

Emmanuel Landau has returned from an assignment as Analytical Statistician, California Department of Public Health, and is now Acting Chief, Community Investigation Section, Air Pollution Medical Program, U. S. Public Health Service.

Charles B. Lawrence, Jr. has been named Chief of Party for the Surveys and Research Corporation, Statistical Advisory Group, which is providing advice on statistical organization and programs to the Republic of Korea.

Harriet Lubin, formerly a Survey Statistician in the Statistical Methods Division, Bureau of the Census, has transferred to the International Cooperation Administration.

Duane F. Marble has accepted a position as Assistant Professor of Regional Science at the University of Pennsylvania.

Julia G. Mash, formerly with the Bureau of Labor Statistics, has transferred to the Office of Program Review and Analysis, Division of Special Studies and Research Development, Bureau of Employment Security.

John C. McKee has been appointed Reliability Engineer for the Douglas Aircraft Company, Long Beach Division.

Forest L. Miller, Jr. Statistician from Purdue University, has recently been appointed to the staff of the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.

James B. Mitchell, formerly with the Wage and Hour and Public Contracts Divisions, is now Chief of the Branch of Statistical Analysis in the Department of Labor's new Bureau of Labor Management Reports.

Walter Mitchell, Jr. has been named Executive Director of the Society for Advancement of Management. For the last three years he has been Associate Professor of Marketing and Applied Economics at the Case Institute of Technology in Cleveland. He will devote his full time in his new position to the Society's administrative and educational activities.

Raymond O. Nelson, formerly head of the Sampling Department at National Analysts, Inc., Philadelphia, has joined Chilton Company's Research Department as Survey Research Division Manager.

G. B. Oakland, formerly Chief of the Statistical Research and Services, Canada Department of Agriculture, has been appointed Senior Research Statistician, the Dominion Bureau of Statistics, Ottawa.

Elihu I. Orleans, formerly a statistician in the Housing Division, Bureau of the Census, has transferred to the Bureau of Naval Weapons.

Leo Orwicz, formerly Chief of the Division of Program and Legislation, has transferred to the Division of Actuarial and Financial Services of the Unemployment Insurance Service, Bureau of Employment Security.

Mary Ellen Patno, formerly Assistant Professor of Biostatistics, Graduate School of Public Health, University of Pittsburgh, is now Associate Professor of Public Health Statistics, School of Public Health, University of Michigan.

K. M. Patwary has obtained his Ph.D. degree in Statistics from the American University, Washington, D. C., and has been appointed as a Statistician to the World Health Organization, Geneva. He has previously been Assistant Professor at Howard University.

Paul L. Poston received the Doctorate of Business Administration degree from Harvard in May 1959. Formerly he was Vice President-Actuary for the Great Lakes Mutual Life Insurance Company, and a part-time faculty member of Wayne State University, Detroit, Michigan. Effective September 1959 he was appointed to the faculty of the School of Business Administration of Northeastern University.

James W. Prescott is completing studies for a doctorate at McGill University, Department of Psychology, Montreal, Canada. He is engaged in research on the conditionability of psychotics under a grant provided by the Dominion-Provincial Government.

Charles A. Roumasset is serving as Acting Regional Director for the San Francisco Region, Bureau of Labor Statistics, during the absence of Max D. Kossoris who has been granted a year's leave of absence.

Alfred Sand, formerly a Mathematical Statistician in the Statistical Research Division, has been reassigned to the Electronic Systems Division, Bureau of the Census.

Jack Sawyer is lecturer and post-doctoral research Fellow in quantitative methodology in the Department of Sociology at the University of Chicago.

Shayle R. Searle has recently returned to New Zealand after completing three years in the Animal Husbandry Department at Cornell University. He has returned to his position as Research Statistician in the Herd Improvement Department of the New Zealand Dairy Board, P. O. Box 866, Wellington, New Zealand.

Norman C. Severo is now with the University of Buffalo as Associate Professor of Mathematical Statistics. He was formerly a Mathematician with the National Bureau of Standards.

Richard H. Shaw received his Ph.D. (Department of Mathematics and Statistics) in July 1959 from Purdue University and is now Staff Statistician with the IBM Research Center, Yorktown Heights, New York. He has resigned the office of President of the Cleveland Chapter of ASA.

Ira G. Spicer, formerly with Lockheed Missiles and Space Division in Sunnyvale, California, has recently joined the research staff of General Electric's Technical Military Planning Operation (TEMPO) in Santa Barbara, California, which is making unique contributions to long-range defense planning.

William C. Suhler has joined the staff of The Johns Hopkins University, Operations Research Office, Bethesda, Maryland, as an Operations Analyst (Statistician).

Joseph Waksburg, formerly Supervisory Mathematical Statistician in the Statistical Research Division, has transferred to the Construction Statistics Office of the Bureau of the Census as Chief of the Statistical Methods Branch.

Barbara Wickberg is the new Director of Research and Statistics for the Kansas State Department of Social Welfare. Prior to this she was employed by Community Research Associates in St. Paul, Minnesota, on an experimental project in the field of public welfare.

Ralph A. Young, Director of the Division of Research and Statistics of the Board of Governors of the Federal Reserve System since 1949, has been appointed Adviser to the Board of Governors, effective January 1st.

Georges Ernest Darmois, distinguished French statistician, died in Paris on January 3, 1960 at the age of 71. Professor Darmois held the degree of Doctor of Science, and had taught at Nancy and the University of Paris. He was a member of the Academy of Sciences of the Institute de France, a member of the International Union for the Scientific Study of Population, a fellow of the Econometric Society, an honorary fellow of the Royal Statistical Society, a former president of the Mathematical Society of France, a former president of the Biometric Society, President of the French Meteorological Society, and President of the International Statistical Institute. He was a Fellow of the American Statistical Association.

E. Dana Durand, a former member of the U.S. Tariff Commission and a past president of the American Statistical Association, died on January 6 at the age of 88. Born in Romeo, Michigan, Dr. Durand graduated from Oberlin College and did graduate work in political science, economics and statistics at Cornell University, receiving his Ph.D. in 1896. He taught at Stanford University before joining in 1899 the United States Industrial Commission, the forerunner of the Federal Trade Commission. He was Director of the Census Bureau in 1910, and later held positions (chiefly in Europe) with the United States Food Administration under Herbert Hoover, and with the Department of Commerce. He was appointed Chief Economist of the Tariff Commission in 1930, was named a member of the Commission by President Roosevelt, and was twice reappointed. He was particularly interested in reciprocal trade treaties and negotiated the first of these with Canada. He was one of the original members of the Central Statistical Board, the predecessor of the Office of Statistical Standards of the Bureau of the Budget. Dr. Durand retired in 1942 after 53 years of Government Service. In addition to his Government career, he taught economics at Harvard and was professor of statistics and agricultural economics at the University of Minnesota. Dr. Durand was a member of the International Statistical Institute, the Inter American Statistical Institute and the American Economic Association. He was President of the American Statistical Association in 1915, and was a Fellow of the Association.

Gale R. Ober, Jr., Director of the Real Property Inventory of Metropolitan Cleveland, died of a sudden heart attack on January 12 at the age of 45. Mr. Ober graduated from Baldwin-Wallace College in 1935, and received an M.A. from the University of Michigan. He was a partner in the firm of Howard Whipple Green, Ober and Associates, which the late Mr. Green had founded. Mr. Ober had nearly completed a monumental four-year study of cost and utilization of Greater Cleveland hospitals for the Citizens' Hospital Study Committee. He was President of the Cleveland Chapter of the American Statistical Association in 1953-54 and was Acting Chairman of the American Statistical Association's Committee on Census Enumeration Areas.

CHAPTER NOTES

An interesting exchange of experiences took place at the breakfast meeting of chapter Presidents, Secretaries and Regional Representatives with national American Statistical Association officers, held at the Shoreham Hotel on December 28th as part of the 1959 Annual Meeting. More than 20 chapter representatives gave brief reports on their chapter activities and problems. These latter included ways of improving chapter programs, increasing membership and attendance, and finances.

Several chapter officers, particularly those from small chapters, reported success with joint meetings with local chapters of other associations, such as the American Society for Quality Control, the American Marketing Association and the American Association for the Advancement of Science. Herbert Ginsburg, President of the Pittsburgh Chapter, thought a social period after the meeting at which coffee and cake or doughnuts were served provided an opportunity to ask questions of the speaker as well as to get acquainted. Harry Sharp, President of the Detroit Chapter, reported their most successful meetings had been those where a cocktail period preceded the meeting. Fred Leone of the Cleveland Chapter thought it was desirable to have a program committee in the chapter rather than depending on one person to arrange programs. Alfred Basch of the Albany Chapter said their experience had been that having local people on panels made for good attendance and good meetings. The Albany Chapter, as well as other chapters, also surveys its membership periodically to ascertain the kind of programs they want and the best time and place for meetings.

Mr. Basch described their arrangements for bringing in new members and stimulating interest. A departmental representative in each state department has been designated to contact new potential members, announce meetings, etc. Edward Hornick, newly-elected President of the Milwaukee Chapter, described a pamphlet, "Why Join the American Statistical Association?" which the Chapter has prepared. The reasons are discussed under the headings "exchange of ideas, mutual problems, national organization, new developments, and prominent speakers." He reported that despite some problems in getting the pamphlet to the right persons eight new members had been picked up.

There was discussion of the plan which is followed by the New York, Washington, and Philadelphia chapters of having dues collected by the national organization. Ed Goldfield, Secretary of the Washington Chapter, thought it had resulted in increased membership. The convenience of writing one check was noted. On the other hand Howard Jones, a Vice-President of the American Statistical Association who has spent considerable time during the past year visiting local chapters, pointed out that there is some confusion where a person joins one organization (national or local) without joining the other.

Sidney Sameth, Secretary of the New York Chapter, said his chapter cut down mailing costs by use of third class mail and by circularizing their members as to their interests and mailing post cards only to those interested. (It should be noted, however, that the New York Chapter publishes a bulletin which announces all coming meetings.) The Philadelphia Chapter has recently adopted a plan for avoiding loss at dinner meetings by giving a deadline for cancellation, after which a member is billed whether or not he is present.

Dr. Rensis Likert, 1959 President of the American Statistical Association, who presided, spoke of the Association's continuing program to improve liaison between the national office and the local chapters. Chapter officers should feel free to write national officers to see if they would be available as speakers for chapter meetings. President-Elect Morris H. Hansen and Donald C. Riley, Executive Director, spoke briefly. Ralph Burgess reminded those present that chapters are entitled to 25 percent of the first-year dues of any institutional members they bring into the Association. The News Editor of *The American Statistician*, Dana M. Barbour, urged chapter secretaries to send notes of their chapter activities for inclusion in *The American Statistician*.

Albany

The October 29th evening meeting of the Chapter was devoted to a pre-Hallowe'en panel discussion by Health Department biostatisticians on the subject, "Biostatistics Unmasked, or Statistical Activities in the New York State Department of Health". The panel consisted of Helen Chase, Norman Allaway, A. Sandra Finch, Charlotte Morris and Robert J. Armstrong. Doughnuts and cider were served.

A luncheon meeting was held on November 24th at which Murray Dorkin, Division of Employment, New York State Department of Labor, spoke on "Estimation of Employment in New York State". The December 16th meeting was also a luncheon meeting, with David L. Kaplan, U.S. Bureau of the Census, speaking on "The 1960 Census—Its Planning, Procedures, and Products".

Dr. Morton L. Levin, Professor of Epidemiology, Roswell Park Memorial Institute, was the speaker at the January 13th meeting. Dr. Levin's subject was "Problems in Cancer Research". An informal pre-meeting dinner was held at Jack's Oyster House.

Future meetings of the Chapter are scheduled as follows:

February 17, 12 noon
Jack's Oyster House, 42 State Street
Morris Kaplan, Technical Director, Consumers Union
"Testing Methods of Consumers Union"

March 16, 8:00 p.m.
Dudley Observatory, 140 S. Lake Avenue
Dr. Curtis L. Hemenway, Director, Dudley Observatory
"Micrometeorites"

April 20, 12 noon
Jack's Oyster House, 42 State Street
Morris H. Hansen, President, American Statistical Association, Assistant Director for Statistical Standards, Bureau of the Census
"The 1960 Censuses, and The American Statistical Association"

May, 1960
Annual Conference—Details to be announced later

Buffalo-Niagara

Dr. Paul R. Sheehe, Associate Biostatistician at Roswell Park Memorial Institute, Buffalo, was the speaker for the November 16th meeting of the Buffalo-Niagara Chapter. Dr. Sheehe's topic was "An Approach to Elementary Causation".

The approach to causation outlined by Dr. Sheehe is based on two fundamental concepts: 1) elementary causation, 2) elementary probabilities of state. It provides a common rationale for the randomization analysis of experiments and for the use of significance testing of certain relationships seen in observed populations. As a particular case in the observational situation, it provides a rationale for the use of significance tests in matched control studies. The approach leads to indexes of the causal strength of observed associations. These indexes focus attention on the extent to which the observational situation may fall short of ideal experimental conditions before serious doubt is cast on the causal implications of an observed association. When used as such these indexes may be of some help in the necessarily subjective matter of interpreting observed associations.

A lively discussion period followed the presentation of the paper.

Central Indiana

The Chapter's "Kickoff" meeting for the 1959-60 year was held in the Purdue University Union Building on October 14th. The speaker was Dr. James Norton, Jr., Assistant Professor of Mathematics and Statistics at Purdue, and the topic was "Effect of Unequal Variance in the Correlated Samples t-Test or Rationalization by Electronic Computer".

A joint meeting with the American Society for Quality Control was held at Butler University on November 10th. Dr. Virgil Anderson, Director of the Statistical Laboratory and Associate Professor of Statistics at Purdue, spoke on "Design of Experiments".

Dr. Ross Robertson discussed the business outlook at the December 3rd meeting. The meeting was held at the Indiana University Medical Center in Indianapolis.

"Partitioning of Index Numbers to Determine Price Movements" was the topic of the January 7th meeting, also held at the Indiana University Medical center. The speaker at this meeting was Dr. Charles Schultze.

The following meetings are scheduled:

February 4th at Indianapolis—Linear Programming

March 3rd at Indianapolis—Presidential Address, Dr. John R. Virts, Eli Lilly & Co.

April 7th or 14th at Indianapolis—a topic on demography or demographic analysis.

Chapter officers for 1959-60 are as follows:

President—JOHN R. VIRTS, Eli Lilly & Co.
1st Vice-President—RICHARD W. GRAVES, Indiana University
2nd Vice-President—JAMES A. NORTON, Jr., Purdue University
Secretary-Treasurer—ROBERT A. CALHOUN, State Board of Health

Central New Jersey

The speaker at the January 19th meeting, held at Princeton University, was Roger Pinkham, Associate Professor of Statistics at Rutgers University. Professor Pinkham's subject was "On the Differential Soiling of Physicists' Logarithm Tables or Why More Physical Constants Have a Low Rather than a High First Significant Digit".

Cleveland

At the October meeting Maurice Sasieni gave a talk entitled "Statistics in Inventory Control".

A panel discussion on "The Use of Statistics in Marketing" was held at the November meeting. Professor J. N. Berrettoni was the moderator.

Chicago

At the November 17th luncheon meeting Herbert Horwich, a partner in Security Supervisors, spoke on "How Statistical Techniques Are Used in Security Analysis". Mr. Horwich explained a technique which he called "Measure of Relative Earnings Trend", consisting of relating the per-share earnings trend of a corporation to that of its industry and that of industrial corporations generally. He said the field of common stock analysis had lagged behind and urged that greater use be made of statistical techniques.

The speaker at the December 15th luncheon meeting was Dr. Ezra Solomon, Professor of Finance, University of Chicago. Dr. Solomon's subject was "Projecting Metropolitan Markets: Chicago Area". He discussed the difference between "trend" analysis and "demand" analysis, and described some of the problems inherent in using trend projections.

Dr. Philip Hauser, Chairman of the Department of Sociology, University of Chicago, discussed "Population Changes in the '60's'—How They Will Affect Markets" at the January 7th luncheon meeting.

Dr. Hauser analyzed population trends that can be expected to affect national and local markets, giving special attention to some of the sociological aspects of market evaluation.

Plans are well under way for the seventh Annual Mid-West Conference. This Conference, which will be held March 25-26 at the Congress Hotel in Chicago, is described in more detail in the "News" section of this issue.

Detroit

"Key Economic Issues in Collective Bargaining" was the subject of the November 19th dinner meeting. The speaker was Nat Weinberg, Director of Special Projects and Economic Analysis, United Auto Workers. Mr. Weinberg discussed the goals of unions in collective bargaining and the impact of technological innovations on man-hour requirements. Dr. Mark Kahn, Associate Professor of Economics, Wayne State University, was guest chairman.

At the January 20th meeting James W. Miller, Controller of the State of Michigan, spoke on "The Nature of Michigan's Fiscal Crisis". The guest chairman for the meeting was Dr. Wallace Gardner, Associate Professor of Statistics, University of Michigan.

Illinois

The officers for the 1959-60 year were recently elected at a meeting of the University of Illinois chapter of the American Statistical Association. They are as follows:

President—EARL R. SWANSON, Department of Agricultural Economics, University of Illinois
President-elect—THOMAS A. YANCEY, Department of Economics, University of Illinois
Secretary—HENRY F. KAISER, College of Education, University of Illinois.

Milwaukee

Dr. Robert A. Kurtz, Department of Mathematics, University of Wisconsin, Milwaukee, spoke at the October 14th general meeting. Dr. Kurtz's subject was "Theory of Independent Random Variables as a Basis of Modern Statistical Methods".

The speaker at the December 10th meeting was George Struck, Director of the Research Department, The Milwaukee Company, Investment Securities. Mr. Struck discussed "Some Statistical Methods in the Investment Securities Analysis".

At this meeting the following officers were elected for 1960:

President—EDWARD F. HORNICK, Sampling Applications, Wisconsin Telephone Co.
Vice-President—LEONARD F. SZEDZIEWSKI, Data Reduction Specialist, G. E. X-Ray
Secretary-Treasurer—JOSEPH W. MCGEE, Associate Professor of Sociology, Marquette University
Recording Secretary—Mrs. VIRGINIA KLECKA, Statistician, Chain Belt Co.

Nebraska

The Chapter opened its second year of operation with a meeting at Lincoln, Nebraska, on October 20, 1959. The tentative program of meetings for the year was outlined to the membership. The speaker for the evening was the Chapter President, Dr. Bernard Harris, who spoke on "Some Large Sample Non-Parametric Decision Procedures in Cataloging Problems".

The December meeting of the Nebraska Chapter was held at the Faculty Lounge of Creighton University in Omaha. The speaker was Dr. Alfred W. Brody of the Creighton University Medical School, who spoke on "A Statistical Study of 24 Variables in the Respiration of Adults". Dr. Brody's talk was highlighted by the exhibition of a device which provided rapid computation of partial correlation coefficients from the correlation matrix. In some respects, the device exhibted by Dr. Brody may be thought of as a three-dimensional nomograph.

The January meeting was held on January 5th at the University of Nebraska, Lincoln, Nebraska. Dr. E. Z. Palmer, Chairman of the Department of Business Research at the University of Nebraska, spoke on "Our Method of Estimating County and City Populations in Nebraska between Censuses".

New York

At the November 5th joint meeting of the Biostatistics and Social Statistics Divisions Paul H. Jacobson of the Metropolitan Life Insurance Co. spoke on recent trends in American marriage and divorce. William J. Goode of Columbia University and Dudley Kirk of the Population Council were discussants. Dr. Jacobson said the prospects for marriage are excellent in the United States. Over 90 percent of all persons now under 25 years of age can be expected eventually to marry. But after the 44ih birthday for men, and the 40th birthday for women the odds are more than two to one against their eventual marriage. Divorced persons are more likely to marry again than are widowed, but the chances of marriage are greater for the widowed than for single persons, except at the very young ages. Dr. Jacobson discussed the effects of war on marriage and divorce, noting that marriages contracted during and immediately after World War II were the least stable.

The speakers at the November 12th meeting were A. M. Freudenthal of Columbia University and Gerald Goldberg, Airborne Instruments Laboratories. Mr. Freudenthal's subject was "Life Testing"; Mr. Goldberg's topic was "Reliability Discussions". The chairman of the meeting was Arthur H. Walner, New York Naval Shipyard.

A joint meeting of the Business and Economics and Social Statistics Divisions was held on December 2nd on the subject, "The Employment and Unemployment Outlook". Seymour L. Wolfbein, Deputy Assistant Secretary of Labor, was the speaker. The discussants were Lazare Teper, International Ladies Garment Workers Union, Albert T. Sommers, National Industrial Conference Board, and Nathan Morrison, New York State Department of Labor. Robert E. Lewis, First National City Bank, was chairman.

At the December 10th meeting Hyman Goldstein, Chief, Biometrics Branch, National Institute of Neurological Diseases and Blindness, spoke on "Some Problems for the Statistician in Collaborative Research". Dr. Milton Maloney, Columbia University School of Public Health, and Samuel Shapiro, Health Insurance Plan of Greater New York, were discussants. Paul M. Densen, Health Insurance Plan of Greater New York, was chairman.

Pittsburgh

The Pittsburgh Chapter's October and November meetings were featured by a pair of papers on "Reliability Statistics" and "Life Testing".

The former was presented by Dr. J. N. Berretoni, Professor and Chairman, Department of Statistics, Western Reserve University. Dr. Berretoni discussed in general the use of statistical techniques for the objective determination of reliability measures and assurances, showing how the Poisson distribution, Weibull's distribution, the binomial distribution, and various tests, involving the fundamental concepts of probability, are employed in the Reliability field.

Life Testing was described by Dr. William Mendenhall, Professor of Mathematics, Bucknell University. Using various industrial products for purposes of illustration, Dr. Mendenhall demonstrated the application of the negative exponential and other types of distributions in the analyses of failure rates. He also reviewed the literature to date.

Saint Louis

Dr. Carl Dauten, Professor of Finance, Washington University, was the principal speaker at the November 19th luncheon meeting, the subject of which was "The Outlook for 1960". Dr. Dauten discussed the general business outlook including sales levels, production and prices.

At the January 21st luncheon meeting Ross D. Boyer, Regional Office, Bureau of the Census, spoke on "Current Census Programs". Mr. Boyer's talk covered plans for the 1960 population census and methods used in the censuses.

Future meetings are scheduled as follows:

February 18—Miss Mildred Kantnor, St. Louis County Public Health Dept., "Method of Community Mental Health Research".

March 17—Dr. Lee Robbins and Dr. William Bates, Dept. of Psychiatry and Neurology, Washington University.

April 21—James Meigs, Federal Reserve Bank of St. Louis, "Measurement of Member Bank Responses to Free Reserves and Interest Rates, An Application of Multiple Regression Methods".

May 19—Hugh Nourse, Roy Wenzlick & Co., "The Effects of Public Housing on Property Values".

San Francisco

A luncheon meeting was held on November 24th at which Arthur Weissman, Director of Statistical Information of the Kaiser Foundation Health Plan, was the speaker. Mr. Weissman's subject was "Measurement Concepts in Medical Economics".

The annual business meeting was held on the evening of January 13th. At the conclusion of the business session Stanley Crook, Deputy Commissioner of the Economic Development Agency of the State of California, spoke on "Problems of Economic Development in California and the Work of the Economic Development Agency".

Southern California

A dinner meeting was held on December 3rd at which James R. Crawford, an analyst in the Military Operations Research Division of Lockheed Aircraft Corporation, was the speaker. Mr. Crawford's subject was "The All-Important Learning Curves".

The Southern California Chapter was one of the sponsors of the 1960 Business Outlook Conference, held at the Biltmore Hotel on January 13th. Topics discussed at the morning session included the national economic outlook, the securities market in 1960, and the outlook for American industry. The afternoon session consisted of a panel discussion on the outlook for the Southern California economy. The conference ended with a dinner session at which John A. McCone, Chairman of the Atomic Energy Commission, spoke on "Countdown for 1960—and Beyond".

Washington, D. C.

The subject of the November meeting was "New Statistics on Polio". The speakers were Donald J. Davids, Morbidity Analyst, National Office of Vital Statistics, who discussed "Trends in Polio Incidence", and Monroe G. Sirken, Chief, Actuarial and Survey Methods, National Office of Vital Statistics, who spoke on "Trends in Polio Vaccination". Dr. Carl C. Dauer, Medical Advisor, N.O.V.S., was discussant, and Dr. Donald Henderson, Epidemiologist, Communicable Disease Center, Atlanta, Georgia, was chairman.

At the January 13th meeting the topic was "Concepts of the Labor Force, Employment and Unemployment". These basic concepts used in the *Monthly Report on the Labor Force* are now 20 years old, and the purpose of the meeting was to discuss how well they had stood the test of time and what changes might be needed. The speaker was Charles D. Stewart, Deputy Assistant Secretary of Labor. Peter Henle, Assistant Director for Research, A.F.L.-C.I.O., and Joseph Zeisel, Bureau of Labor Statistics, were discussants. Raymond T. Bowman, Assistant Director for Statistical Standards, Bureau of the Budget, was chairman. After the scheduled talks there was some discussion from the floor.

CONTRIBUTED PAPERS INVITED FOR 1960 ANNUAL MEETING

The 1960 Program Committee invites members to submit papers for the Contributed Papers Sessions at the annual meeting to be held August 23-26, 1960, Stanford University, Stanford, California. The Contributed Papers Sessions are intended to serve especially as a forum for the presentation of individual papers on new developments in statistics. Contributed papers can also be pointed toward the general theme of the meeting which is statistics and international relations. These Sessions serve the purpose of broadening the scope of papers at the annual meeting, to cover new work falling outside the limited number of topics arranged for by the Program Committee. It is hoped also that these Contributed Papers Sessions will encourage young members of the Association to submit their papers.

Deadline for submitting topics for the Contributed Papers Sessions is March 15, 1960. The complete paper need not be submitted by that date but it will be necessary to submit a summary indicative of the nature of the proposed paper. Some restrictions on the number of papers may be required in view of time and space limitations at the annual meeting. Submissions may be made direct to the Chairman of the Program Committee, Philip M. Hauser, Chairman, Department of Sociology, University of Chicago, 1126 East 59th Street, Chicago 37, Illinois, or to any of the Section Program Representatives listed below.

Biometrics Section
Oscar Kempthorne
Professor of Statistics, Iowa State College of Agriculture, Ames, Iowa

Business and Economic Statistics Section
Robert J. Eggert
Marketing Research Manager, Ford Motor Company, The American Road, Dearborn, Michigan

Section on Physical & Engineering Sciences
Joseph M. Cameron
Statistical Engineering Laboratory, National Bureau of Standards, Washington 25, D. C.

Social Statistics Section
Frederick F. Stephan
Department of Economics and Sociology, Princeton University, Princeton, New Jersey.

Section on Training
J. Parker Bursk
Room E220, Dietrich Hall, University of Pennsylvania, Philadelphia 4, Pennsylvania

THE PRESIDENT'S COLUMN—CONTINUED FROM PAGE ONE

of the JOURNAL. The report of the Secretary-Treasurer will also be printed in full in the June issue of the JOURNAL. It includes details on membership, 1959 actual income and expense, 1960 estimated budget and so forth. The report notes that membership is continuing to climb—the figure is now over 7,000. A small addition to the cumulative surplus resulted from income being about $5,000 greater than expense. The 1959 audit report from the firm of Alexander Grant & Co. will also appear with the above reports.

The Board and Council were very pleased to welcome the new Editor of the JOURNAL, Clifford G. Hildreth. An announcement of his appointment appears elsewhere in this issue. Tribute was paid to the retiring Editor, W. Allen Wallis, who served from 1950 to 1959. Thanks were also extended to David L. Wallace who was so kind in serving as Acting Editor for most of the year.

The analytical report of the Publications Policy Committee was presented to the Council. This report appeared in the December, 1959 issue of THE AMERICAN STATISTICIAN. I urge you to read it, if you haven't already. It is a study of the questionnaires mailed in the Fall of 1958 to a large sample of the American Statistical Association membership, asking how they thought the Association's publications are serving the needs of the American Statistical Association. A specimen of the questionnaire appears with the report to show the questions asked. Your comments are invited.

At the end of its first year TECHNOMETRICS has exceeded the goal originally set by the Management Committee. Details on this were given in Mr. Likert's column in the December, 1959 issue, so I shall not repeat them here. Further reports on the progress of TECHNOMETRICS will be given at regular intervals.

Reports from the Association's Sections, Committees and Representatives to other societies were also included for the Council. The Social Statistics Section's 1959 Proceedings were approved for publication. This volume will be printed and distributed by early Spring, as will the 1959 Proceedings of the Business and Economic Statistics Section.

An extensive report was received from the Committee on Committees. This group is charged with studying the need for revisions in the current constitution; examining the possibilities of new section interests; and investigating suggestions for changes in the structure of any committee or body representing the Association. Since the Committee on Committees is actively engaged in looking into the above matters it is too early for further details at present.

The topic of perhaps the widest interest is a proposed conference of representatives of statistical societies. This project, initiated by Rensis Likert during his term, is for the purpose of considering the possibility of closer coordination and cooperation among the several societies who have important interests in statistics. There seems to be increasingly widespread acceptance of the view that the splintering which exists reduces effectiveness in some important respects, and that some steps toward federation or coordination should be considered. There is a good possibility that at least part of the funds necessary to hold one or more conferences can be obtained from one of the foundations. Further progress will be reported in due course.

Finally I'd like to remind you of the 1960 Annual Meeting at Stanford University, August 23-26. Plans on the program and on local arrangements are well along. We hope that you will attend, perhaps in connection with your vacation. More information on this first West Coast meeting of the Association will appear in THE AMERICAN STATISTICIAN and in direct mailings to all members. It is not too early to begin making your plans.

THE RELATION BETWEEN CONFIDENCE INTERVALS . . .

—CONTINUED FROM PAGE 18

rarely black or white, and decisions are rarely made on one-shot tests, but usually in conjunction with other information. Confidence intervals give a feeling of the uncertainty of experimental evidence, and (very important) give it in the same units, metric or otherwise, as the original observations.

The author is indebted to Dr. Churchill Eisenhart and Dr. Norman C. Severo who encouraged the writing of this paper.

REFERENCES

[1] *ASTM Manual on Quality Control of Materials*, (1951), p. 45. Available from the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania.

[2] Joseph Berkson, "Comments on Dr. Madow's 'Note on Tests of Departure from Normality' with Some Remarks Concerning Tests of Significance". *J. Amer. Statist. Assoc. 36*, No. 216, pp 539-541 (1941).

[3] Joseph Berkson, "Tests of Significance Considered as Evidence", *J. Amer. Statist. Assoc. 37*, No. 219, pp 325-335 (1942).

[4] Edwin L. Crow, "Confidence Intervals for a Proportion", *Biometrika, 43* pp 423-435 (1956).

[5] Maurice G. Kendall, *The Advanced Theory of Statistics, Vol. II*, pp 134-136, Hafner Publishing Co., New York (1951).

[6] Walter A. Shewhart, edited by W. Edwards Deming, *Statistical Method from the Viewpoint of Quality Control*, The Graduate School, Department of Agriculture, Washington, D. C. (1939).

[7] W. Allen Wallis and Harry V. Roberts, *Statistics, A New Approach*, pp 461-463, The Free Press, Glencoe, Ill. (1956).